Telephone Engineer

WITH WHICH IS CONSOLIDATED THE WESTERN TELEPHONE JOURNAL
ESTABLISHED 1902

VOL. XIV CHICAGO, JULY, 1915 No. 1

Will the Independents Fight This Case?

DOWN in Florida there are five cities almost in a straight row from North-Northeast to South-Southwest, with a distance of about eighty miles between the ends of the row. These cities are, from North to South: Dayton, Deland, Sanford, Orlando, Kissimmee.

Each of these points is operated by an Independent telephone company. There is an Independent toll line from Kissimmee to Sanford. There is an Independent toll line from Deland to Daytona. Independent operators were about to build a toll line from Sanford to Deland—the last link in the chain.

The Bell interests have bought the Sanford Independent plant and destroyed the chain. This plant had recently been invoiced at $11,500. The Bell people are alleged to have paid $22,000 for it.

There is nothing new in this sordid commercial story. It is so old, indeed, that a good many telephone men have jumped to the conclusion that it was obsolete. Having only Bell promises as a foundation for this belief, their judgment was obviously premature.

The Bell Company already had toll lines between the points involved in this story. The projected Independent line, Sanford to Deland, would not have been an exclusive, but merely a competing highway. Purchasing the central link destroyed that competition.

It is not necessary to refer to the notorious Kingsbury letter of eighteen months ago in this case. The situation and the law are clear enough without it. It is not even a question of law, but merely of fact—and of one other vital consideration.

That other factor, which is the one to decide the outcome of this case—and others—is the color of the fluid that flows in Independent telephone men's veins. Have they got fight enough left in them to take even one of the courses that lie wide open before them?

When an act of unquestionable illegality is committed against a citizen, even the meanest-spirited of men will take vigorous action for its punishment. Substitute a corporation for the citizen, and we have a fine test of character applied to the responsible heads of the corporation. Will they meet the issue like citizens, or evade it by disclaiming responsibility?

There are several ways of ducking trouble in a case like this. You can become a quick convert to monopoly and credit the sale to divine inspiration. You can shrug your shoulders and put the responsibility on some other fellow—it doesn't matter much who gets it. You can wring your hands and call it the end.

But meantime the courts and the commissions and the government continue to work. Outside of the telephone field the verdict of "guilty" is not so very uncommon. Maybe the other fields have more fight in them than the telephone Independents have. Maybe, too, many of the Independents are hoping the same thing will happen to them; that they will be able to sell ten thousand dollars' worth of property for twenty thousand, because Providence has placed in their hands the ability to ruin their friends. If that kind of talk gets you hot under the collar, make us take it back!

The Florida case is wide open. Any lawyer worth his salt will tell you that. But a man can pull the stickpin out of your scarf and walk off with it, and the law will do nothing for you if you keep still.

If the Kingsbury letter made the Independents think they could burn their arms and fire their lawyers, then it was a howling Bell success, and deserves credit. All's fair in war, and poisonous gases are now regarded as quite the thing. Regardless of any personal choice between Bryan theories and Kaiser Wilhelm practices, the Independents have got to fight to stay in the telephone business. The telephone millennium is not here.

If you are an Independent operator, you might as well make up your mind that sooner or later you will be forced to spend money and time to save your business, or to sell out your friends to save yourself. Take your choice. If you expect or hope to sell, you are not worth talking to. If you are willing to fight, get together now, decide upon your counsel, and start.

Force Physical Convention

IT IS time that the doctrine of compulsory physical connection be carried, if necessary, to the highest court to determine for all time its legality. For the public benefit, every telephone must be accessible to every other telephone. That is the argument of the monopolists, and the only one to which we can subscribe. But to establish the condition no more requires monopoly of telephone lines than to send freight from any point to any other point requires railroad monopoly. Universality as an argument for monopoly is pure sophistry.

But monopoly, if it existed, *could* give "universal service," and so monopoly will fight to the last ditch the

principle of physical connection. Its favorite weapon in this particular warfare is the claim that connection would be confiscation. The idea is that it would be unfair to give a small company access to a large system, thus making it unnecessary for the small company to build its own large system.

That is more sophistry. The advantage, if there is any either way, still lies with the larger company.

An operating telephone company is in business to make money by serving the public. It does this by collecting a certain amount for each call that comes in to its switchboard—whether under service contract or not. It makes no difference whether the call originates at one of its own telephones, or at a telephone connected to another company which trunks the call to it, *provided the rate per call is adjusted equitably in each case.*

A call originating with one company and terminating with another splits its service cost in varying ratio between the two companies. Therefore, if the fee collected is split in the same ratio the transaction is equitable and profitable for both companies. The relative size of the two companies has nothing to do with the matter. The small company has a large number of calls to trunk to the large company, and so pays a relatively large amount in split fees to the large company. The large company has few calls to transfer to the small company, and so pays a relatively small amount in split fees to the small company. In short, the small company is a bigger source of income to the large company than the large company is to the small company.

There is no economic objection to compulsory physical connection. The burden of proof against this statement is on those who oppose it; and they have no possibility of proving it wrong. Independent telephone men must be convinced of this truth; but it is not enough that *they* realize it. It is necessary to convince the commissions and the courts that *all telephones must be connected,* and that they *can* be connected with benefit to everybody and loss to none.

With loss to none, in legitimate business and legitimate earnings. But loss there would be; loss of the strongest grip of monopoly and loss of the opportunity to surround and destroy Independent service by sheer might of organization.

Compulsory physical connection is the most important consideration before the Independent telephone operators today. It is even more important, if possible, than the fighting of specific cases of suppression of competition. And if it is urgent that the Independents demand such connection, it is equally incumbent upon loyal Bell interests to refuse it. That means a fight; but we believe the Independents must win the fight if they have enough energy and tenacity to see it through.

So, like all other Independent-Bell disputes, the problem of physical connection simmers down to a measure of the sincerity, earnestness and energy of the Independents. If they were as willing as they are able to push their claims with proper legal representation they would have fewer occasions to "cry wolf."

WINKING AT DISCRIMINATION.

"I DO not see how we can tell the Bell people they shall charge $1.50 per month when they are willing to furnish it for $1.00," said City Commissioner Wallace of Paducah, Ky. Probably not. It is too big a question for a city official to answer.

The Central Home Telephone Company is charging Paducah $1.50 for the service the Bell company asks $1 for, and the $1.50 rate is claimed to break even and no more. Knowing the efficiency of the Central Home organization, we must conclude that the Bell company is losing money at $1. But the city don't care. If it was proved to the city officials that the Bell company was cutting prices to drive the Independent out, they would probably say, "We should worry, Paducah gets the benefit of the fight."

In a purely cold-blooded and near-sighted sense, perhaps it is not the city's business to interfere. But unfortunately Kentucky has not yet appointed a state public utility commission, which morally throws some responsibility for square dealing upon the community, especially where local capital is probably invested.

Neither a telephone company nor a grocer does business for health alone. When a grocer offers strictly fresh eggs for ten cents a dozen in mid-winter, either there is something wrong with the eggs or the way he got possession of them, or he is trying to drive a competitor out of business. If we find the eggs are all right we buy them and cry more power to the grocer.

But a public utility stands in a different light. In the absence of any higher regulating body, the municipality undertakes to regulate the utility's rates. By franchise and ordinance it places such limitations on the schedule that it is impossible to charge above a certain rate. That being the case, and the city's power in the premises being recognized, it is morally, if not legally, obligated to protect the utility from the piratical attacks of outside utilities whose local plant is merely one of many branches.

It must be apparent to even a city official's intelligence

Editors: ED J. MOCK, PAUL H. WOODRUFF
Advertising Manager: ALLEN L. HAASE
Associate Editor: FRED R. SCHAFER
New York Representative: CHARLES R. CONDON
New York Office, 1022 Longacre Building
Forty-second St. and Broadway
Telephone Bryant 7030

This publication is free and independent of all business or house connections or control. No manufacturer or supply dealer, or their stockholders or representatives, have any financial interest in Telephone Engineer or any voice in its management or policy.

Entered at Chicago Post Office as Second Class Mail Matter

Telephone Engineer
WITH WHICH IS CONSOLIDATED
The Western Telephone Journal
ESTABLISHED 1902
PUBLISHED MONTHLY BY
ELECTRICITY MAGAZINE CORPORATION
MONADNOCK BUILDING, CHICAGO, ILL.
Telephone: Harrison 3014—All Departments

NOTICE TO ADVERTISERS

Changes of advertising copy should reach the office of publication not less than ten days in advance of date of issue. Regular date of issue, first day of each month. New advertisements will be accepted up to within five days of date of issue, but proof of such advertisements cannot be shown in advance of publication.

SUBSCRIPTION PRICE
For Year $2.00

Canada	$2.50
Foreign	3.00
Single copy	.20

FOR SALE AT ALL NEWS STANDS

NOTICE TO SUBSCRIBERS

REMITTANCES — Remittances should be made by check, New York draft or money order, in favor of TELEPHONE ENGINEER. Foreign subscriptions may be remitted direct by International Postal Money Order.

CHANGE OF ADDRESS—The old address should be given as well as the new, and notice should be received two weeks in advance of the desired change.

If Your News Dealer Will Not Supply You—Please Notify Us

that a corporation operating in a number of states, and in most of the cities and towns in each of those states, is in a position to cut rates far below the point of profit in a few of its branches without any appreciable effect upon its aggregate revenue. And what slight comparative cost there is to the operation is well repaid when a competitor is driven out of business.

This is the "permitted discrimination" of which we spoke last April in these pages, and it is discrimination of the worst type—discrimination that is characteristic of the predatory corporations which go gunning for competitors.

It is the duty of the city of Paducah, Kentucky, unless it is willing to be a party to the embarrassment of a Kentucky utility, to investigate the telephone rate of $1 per month and assure itself that such a rate is unprofitable. And when it has so assured itself, its commission should emulate the action of those state commissions which have wisely found revision upward as important a part of their rate decisions as revision downward.

A PROFIT SHARING COMPANY.

HE new president of the San Diego (Cal.) Home Telephone Company, Charles E. Sumner, has inaugurated a unique scheme for sharing the profits of his company with its subscribers. All profits above interest charges and a three per cent dividend on stocks will be distributed among subscribers. To assure the subscribers that they are getting a square deal, the company has made John A. Gillons, president of the San Diego Merchants' Association, a director.

The San Diego arrangement is brand new, so far as we know, and a very pretty scheme. That it will be practical so far as getting subscribers is concerned we cannot doubt. The only question is whether it may not be too altruistic in some of its provisions.

Three per cent is hardly enough return on investment to satisfy the average stockholder in a public utility. He can get as much from a savings bank or government bonds—which, arguments and records notwithstanding, are generally regarded as safer repositories for spare money.

Theoretically there need be no limit to the rates charged by a co-operative company such as the San Diego Home purposes to be. What excess the subscribers pay in they get back again. Practically we presume the state regulating commission will place the same limits of "reasonable return" on a profit-sharing company that it would on an ordinary utility operating for profit. If that limit be eight per cent, then the subscribers will receive five per cent after the stockholders have drawn their three per cent dividends.

It is possible that we are too far from the object of our comment to get the right light on that three per cent clause. Surely if the stockholders are satisfied no one else has cause to complain; and we can assure President Sumner that we see no other flaw in his extremely interesting venture. Its progress during the next year will be worth watching.

REFUSE SERVICE TO DELINQUENTS.

THAT telephone companies are within their rights in refusing service to subscribers who are in arrears for service already given is the decision of the United States Supreme Court handed down June 21. The case was that of the Southwestern Telephone and Telegraph Company **vs.** Adelia P. Danaher. The decision reverses that of the Supreme Court of Arkansas, as well as several of the state commissions. This opinion restores the right of the operating company to cut off the service of delinquents, and is therefore of great importance.

WINTER STORM DAMAGE IN ILLINOIS.

Permanent repairs on its storm-damaged lines in Lake, McHenry and Kane counties have nearly been completed by the Chicago Telephone Company. An accounting just taken by the company, shows its loss to be more than $70,000.

The sleet storm which played such havoc with telephone poles and wires in northern Illinois and in Wisconsin, began January 31 and lasted until February 3. During that comparatively short time 700 telephone poles were blown down or broken by the force of the storm and nearly 4,000 telephones were temporarily put out of commission.

However, telephone service was not allowed to lapse for any length of time. Temporary lines were strung and service restored in most places within a few hours after the storm was over.

The task of making temporary repairs is a big one but from many years of experience with storms the Telephone Company has evolved a wonderful system for bringing order out of chaos and re-establishing service within a brief space of time.

All of the repair work in the February storm was directed from the main office in Chicago.

AUTOMATIC SEEKS NASHVILLE FRANCHISE.

Granting a franchise to the Automatic Telephone Company of Nashville, Tenn., an ordinance was introduced in the board of city commissioners, the company being authorized to construct, maintain and operate a local and long distance telephone system in Nashville.

The company's main purpose is to connect the various Home telephone companies that are operated in the similar cities of the state.

The ordinance provides that the company shall not charge in excess of the following rates in the city of Nashville:

For each special long distance, metallic circuit business telephone, $5.25 per month; and for each special line long distance metallic residence telephone $2.50 per month; for each two-party line long distance, metallic circuit business telephone, $4.25 per month, and for each two-party line, long distance, metallic circuit, residence telephone, $2 per month.

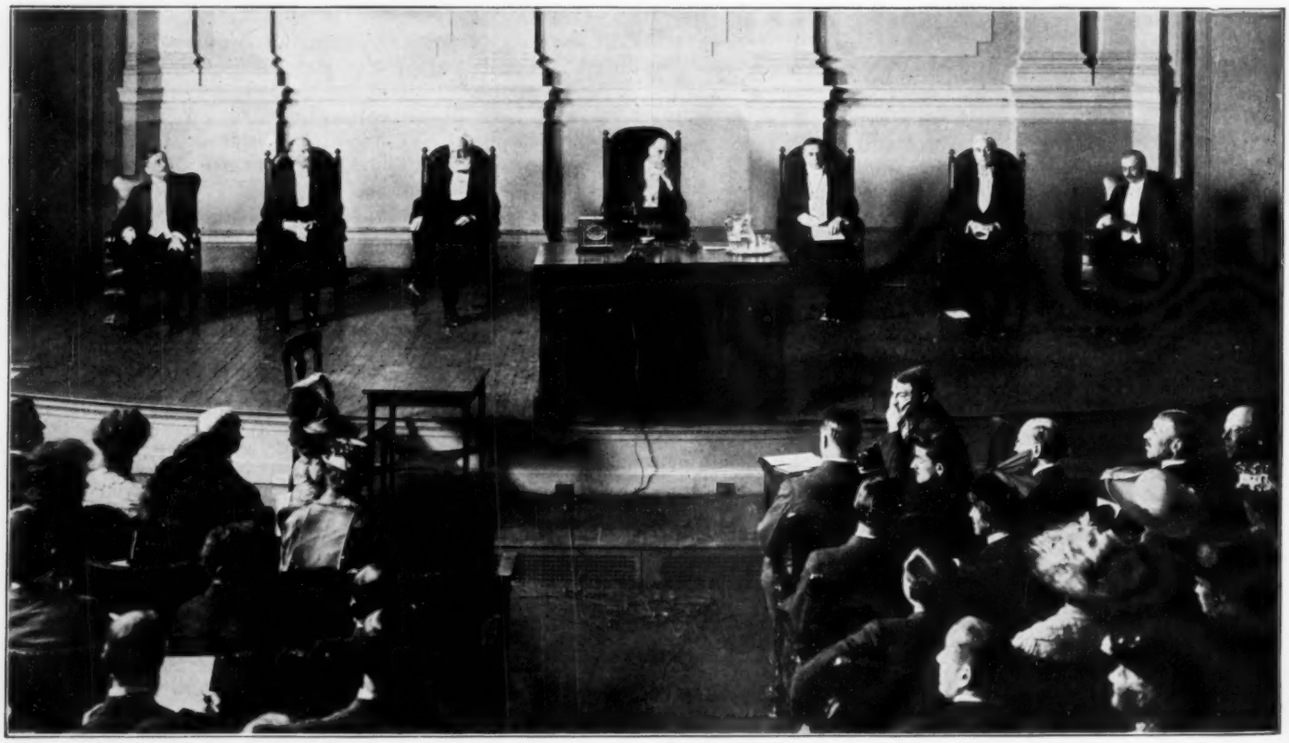
For each three or four-party line, long distance, metallic circuit, business telephone, $4.25 per month; for each three or four-party line, long distance, metallic circuit, residence telephone, $1.75 per month.

With the specificed exception of private branch exchange, trunk and switch board rental rates, these rates shall at no time in the life of this ordinance be exceeded; but these rates are effective upon a yearly contract basis, and if any telephone is removed before the period of the contract covering its installation has expired, the grantee, their assigns, etc., shall be allowed to charge for the actual cost of installation and removal plus t en per cent administration charge.

The above rates being payable monthly in advance, but the grantee hereunder shall grant a discount of 25 cents per month on each telephone to each subscriber whose monthly rent is paid on or before the tenth day of each month.

The man with his brains in the right place wishes every day had forty-eight hours that he might accomplish part of his plans; the other kind of man wonders how he can kill time.

Members of the Associated Advertising Clubs of the World in Convention at Hotel La Salle Roof Garden, Chicago, All in Telephonic Connection With San Francisco, Cal.—Courtesy Chicago Telephone Company.

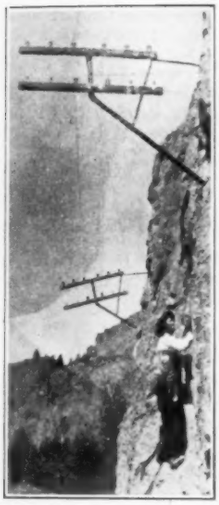


Dr. Alexander Graham Bell was the recipient of the Edison Medal "for meritorious achievement in electrical science" at the annual meeting of the American Institute of Electrical Engineers in New York, May 18. Seated on the stage, left to right, are—John J. Carty, chief engineer of American Telephone and Telegraph Company and president-elect of American Institute of Electrical Engineers; Union N. Bethell, senior vice-president of American Telephone and Telegraph Company; Dr. Alexander Graham Bell; Dr. Paul M. Lincoln, president of American Institute of Electrical Engineers; Schuyler Skaats Wheeler, chairman of Edison Medal Committee; Thomas A. Watson; F. L. Hutchinson, secretary American Institute of Electrical Engineers.—Courtesy Bell Telephone News.

STORIES IN PICTURES OF TELEPHONE PRACTICE AND PROGRESS IN ALL PARTS OF THE WORLD.

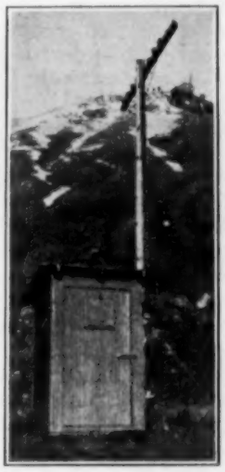
A Truck Load of Telephone Operators, Showing How the Chicago Telephone Company Transported Its Employes to and From Work During the Street Car Strike.

Chicago Telephone Company's Float in the Prosperity Parade, Which Followed Mayor Thompson's Inauguration.—Courtesy Chicago Telephone Company.

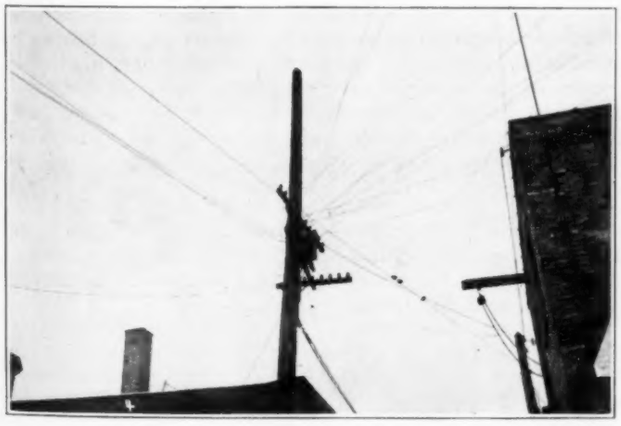


Where Trouble-Shooting Is a Serious Occupation. On the Lake City-Ouray Toll Line of the Mountain States Telephone and Telegraph Company. — Courtesy Mountain States Monitor.

Operators of the Chicago Telephone Company Being Entertained at Hotel La Salle by the Company During the Big Street Car Strike in Chicago.—Courtesy Chicago Telephone Company.



One of the Test Houses in the Wild Country in the Leadville District of the Mountain States Telephone and Telegraph Company, Which Save Lots of Money and Trouble in Locating Faults in Rough Territory. — Mountain States Monitor.



Two Views Showing Unsightly Aerial Situations Which Might Be Materially Improved.

STORIES IN PICTURES OF TELEPHONE PRACTICE AND PROGRESS IN ALL PARTS OF THE WORLD.

Dubuque May Install Automatic

It is expected that there will soon be another telephone company operating in Dubuque, Ia.

Dissatisfaction with the local telephone company and its refusal to procure a franchise to pay into the city coffers an annual amount of money is said to be responsible for the unfavorable feeling against it that has been magnified greatly during the past month.

A representative of the Automatic Electric Company has been called in to appear before the city officials and state what sort of a proposition his company could make.

It is stated that the Automatic Company has made a very attractive offer to the city and it is within the line of possibility that the city will accept. In that event, it will be but a short time until there will be another and more modern telephone company operating in Dubuque.

The chief source of trouble lies in the new ordinance in which the local telephone company is asked to pay a wire and pole rental to the city each year. The total annual amount of money the city would derive from the telephone company under the new ordinance would approximate $5,000. Should the company take out a franchise it would cost it the same amount of money.

Officials of the company are officially quoted as having said that if the ordinance is adopted it will lower employes' wages, make East Dubuque and other nearby places regular long-distance toll stations, cut down on equipment and on service and raise the telephone rates in the city. However, the ordinance makes provision for that in a clause which states that should the telephone company raise its rates, the city's tax would automatically be raised to the exact figure that the rates were raised. No action has been taken by the city yet and probably will not be for a short time.

Texas Merger Offers $10,000 a Year Saving

Referring the matter to the public improvement committee, the city council of Temple, Tex., heard discussions relative to a merger of the Southwestern Telegraph & Telephone Company and the Texas Telephone Company, both now operating in Temple. Vice-president Farnsworth of the former company and President Earle of the latter were present to present all details concerning the movement which was started some time ago by the Chamber of Commerce, later to be agitated again by the Retail Merchants' Association.

It was declared by Vice-president Farnsworth of the Southwestern that the two concerns do not want a merger if the consent of the people, at least the consent of two-thirds of the total number, is not procured. Neither line would favor retiring from business in Temple if the people oppose such steps.

It was stated that a saving of approximately $10,000 each year to Temple people would be made by a merger of the two lines.

Under the new franchise the Independent line, if a merger is perfected whereby the Southwestern local exchange is taken over by the Texas Telephone Company in Temple, would raise its maintenance rate from $3 to $4 in order to properly handle the additional subscribers which would be added as a result of the merger. In some cities, it was stated, the increase is 25 cents additional rental per telephone, for each additional 500 telephones added to the switchboard. In short, the larger the exchange, the higher the rate, in order to maintain the better equipped office.

An Invitation

Editor TELEPHONE ENGINEER: In view of the fact that California is acting as host to America this year, it seems proper for the Home Telephone and Telegraph Company of Los Angeles to do its share in this direction.

In the name of this company, therefore, I desire to extend through you, a most cordial invitation to the telephone men of America to visit Los Angeles, and the exchanges of the Home Company, and I shall appreciate any publicity you may be able to give this invitation.

Our company is keeping "open house" during the exposition season, and we are prepared to extend to all who may accept our invitation every facility to inspect our property.

It is hardly necessary for me to expand here upon the advantages offered to the tourist by California, and by Los Angeles in particular, but we feel that we are entirely justified in believing that a visit to our exchanges would be of real interest and value to the members of the telephone profession.

The Home Telephone and Telegraph Company is operating the largest independent city system in the United States, and the construction problems we have met here have been in many ways unique. The development of our central office system has also been of more than usual interest, passing through the successive stages of full manual operation, combined manual and automatic, and, finally, full automatic, and we now have in service more than 60,000 stations, the largest automatic plant in the world.

We offer the telephone men of America the attractions of a charming city, a climate which is world famous, a telephone system worthy of study, and a most cordial welcome to all who may be able to pay us a visit. Very truly yours,

H. N. CASS.

Milwaukee Investigates Telephone Rates

Fifty-three thousand telephones are in operation within the Milwaukee zone of the Wisconsin Telephone Company, comprising the city and those sections of the suburbs that can be reached with one fee or, on main lines, without paying an extra fee.

On January 1, this year, there were 2,513 unlimited business telephones in existence, 836 one-party business telephones, 2,767 two-party business lines and 2,147 four-party business wires.

At the same time the residence telephones aggregated 201 one-party lines, 1,143 two-party lines and 12,527 four-party lines.

This evidence was presented at the opening session of the hearing before the commission on a complaint for reduced telephone rates in Milwaukee.

The action was started five years ago. In the meantime the railroad commission has valued the property, which evidence will constitute a part of the hearing.

The city's contention is on the working capital, that the company is not entitled to any special consideration on its working capital because it receives pay in advance from subscribers and, he maintained further, that the system of discount for cash counteracts any expenditure the company might be obliged to make for interest on borrowed money.

Ohio State Lists Stock

Otis & Company, which purchased and marketed the stock of the Ohio State Telephone Company has been lifted and application has been made to list this security on the stock exchanges of Toledo, Cleveland, Columbus, Cincinnati and St. Louis.

Since the formation of the Ohio State Telephone Company on July 23, a few days before the outbreak of the war, the syndicate sold $3,000,000 of the preferred stock and $900,000 of the common.

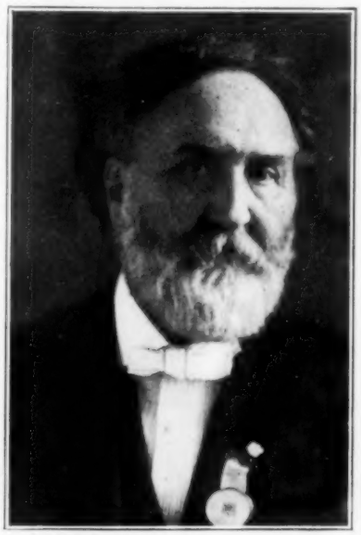
The stock is held in all sections of the state, and figures to date show that there are more than 1,100 shareholders, a figure which compares very favorably with distribution of stock in other public utilities of the state.

Is Competition Right or Wrong?

Some Light on the Merger Situation as Developed Since the Kingsbury Letter

BY HON. E. B. FISHER

HAVE we, the Independent telephone people of the United States, been wrong in our theories of business all these years? Was there occasion for our getting into the business? Has it been useful to the public? And fairly successful for ourselves and those who aided our efforts? Let's reason together, soberly, honestly, with fairness to the public as well as candor for ourselves.



Hon. E. B. Fisher, President of the Independent Telephone Association of America.

Is competition a good thing?

When the Congress of the United States, so many years ago, in the passage of the Sherman Law so declared with but one dissenting vote in the two houses—and with no pairs—after many months of consideration of the subject and many conferences of committees, did it reflect the careful, deliberate opinion of the people? When Pennsylvania and other states included the idea in their constitutions, can it not be reasoned that the people of such states thought so? Has any considerable body of the public at any time since dared to agitate for repeal of such constitutional provisions and laws? What was the temper of the last Congress? What is the theory of the President as expressed in his "New Freedom"?

Does anyone, in all the land, openly advocate monopoly in any business with which he is not connected, or by which he is not benefited? In other words, isn't competition, in his opinion, essential as well as just in every business save possibly his own? That is to say, can it not be affirmed that competition (outside our own, individual interests) is absolutely and everlastingly right? Then shall our various little, limited interests essentially modify or negative that right?

To come back then to the concrete, to the opening question of this discussion, are we right? Was competition in the telephone business useful, beneficial to the public in 1896, 1900, 1905, and so on through the past years? If it was, has it ceased to be? Is the business different from any and all others of which we have any knowledge? Is it the extraordinary exception to what is otherwise regarded as the universal rule?

Did competition in telephony benefit the public? What were the practical conditions after about eighteen years of indisputable monopoly—properly so because of patent laws—in telephony? Were telephones the general servants of the people, or the luxuries of the limited few? Did all the people want them? Could they get them?

The business had been profitable—nobody dare deny that—there was plenty of capital for such business, as has been amply and wonderfully demonstrated since, yet the generally accepted statistics are that there were less than 350,000 telephones in the whole United States, after 18 years of monopoly—less by nearly twenty-five per cent than the number of Independent telephones now in service in the single state of Ohio! There were then but about 13,000 telephones in service in all Michigan, which was reported to be No. 2 in per capita development in the whole country—nearly a thousand less than the number of Independent telephones now in service in Grand Rapids City exchange alone! Is there a city which has had no competition that offers any such statistics?

Does anybody believe that there would be nearly 10,000,000 telephones now in use in the United States had not there been the spur of competition? Did the conditions at the close of the patent monopoly of about 18 years suggest any such tremendous development in the next 18 years?

Is it necessary, reasoning with telephone people, to enlarge upon the benefits of telephone service? To talk of rural service, of branch exchanges, of the reaching of millions of homes rather than a very few thousand? Does not the press teem with "ads" about "universal service" and the almost unanimous use of it?

Can it be doubted that very much of this tremendous development was one of the direct effects of competition? Is it necessary to enlarge upon this premise?

The benefits of competition in the field of invention, of improvement of apparatus, in number and skill of operatives, in cost of operations and resulting cost of service to customers need only be hinted at—the story could be enlarged indefinitely and yet fall short of the reality.

We may say, then, that we are still fairly agreed that we were right—that we are right—that competition *was* and *is* right. Then it should continue, for principles do not vary or cease.

There is an interest that has been fighting this competition unceasingly, determinedly all these years; competition has been in its way. That interest, which announced acceptance of competition in a notable letter of date December 19, 1913, is still struggling against it, in the guise of "unified" or "universal" or "single" service. We read of it as affecting Montana and western Washington and Idaho and Los Angeles and southern Michigan and West Virginia and eastern Ohio and Texas towns and the opinions of some Indiana Public Service commissioners—as to more than 150 exchanges in more than 20 different states!

If we were right, if we still are right, then we have a very important duty, a very important service to render ourselves and our colleagues in the business—a service of almost incalculable moment to the public.

We should avail ourselves of the law—there seems to have been no doubt of its applicability on the nineteenth of December, 1913. We should open a vigorous campaign of publicity—we should set the people, the public service commissioners, the telephone users, right on this matter. We should remember that "United We Stand, Divided We Fall" is absolutely as true today as it ever was. There's work to do, much of it, of almost incal-

culable importance—and we must "go to it" individually and collectively.

* * *

Because the maxim, "By their fruits ye shall know them," was first uttered long, long ago, it is none the less true. It expresses a fact in human experience of great moment, of unquestionable importance. Not by their promises, not by their pretensions or their appearances, but by their acts, "by their fruits, ye shall *know* them."

When in December, 1913, the 19th day thereof, a vice-president of the American Telephone & Telegraph Company addressed a letter to the attorney general of the United States and made therein certain definite statements, promises, if you please, you didn't "know" that great corporation, or its officers. It is true that that letter made it clear that it was the result "of a number of interviews between us during the last 60 days," and followed a distinct conclusion of the A. T. & T. Co. "and the other companies of the Bell System," which had been "determined upon." So you might have supposed that you had some real knowledge on the subject or matters discussed therein. Do you remember them?

One of the paragraphs of that letter reads as follows:

"Second: Neither the American Telephone & Telegraph Co., nor any other company in the Bell System will hereafter acquire, directly or indirectly, through any of its physical property or of its securities, or otherwise, dominion or control over any other telephone company owning, controlling or operating any exchange in competition with any exchange or line included in the Bell System, or which constitutes or may constitute a link or portion of any system so operated, or which may be so operated in competition with any exchange or line included in the Bell System."

The only exceptions to the foregoing, which seemed a solemn promise from a responsible party (it was evidently so construed by the then attorney general and his chief as per letters made public in connection with the promise) were that where bargains had already been completed, or practically so, though not made public or properties actually taken into possession, under the control of the Department of Justice and the Interstate Commerce Commission, they might be completed.

Those letters from the attorney general and his chief did not wait for "their fruits." The President said, "It is very gratifying that the company should thus volunteer to adjust its business to the conditions of competition," and that he gained the impression that the business men of the country are sincerely desirous of conforming with the law, and "so long as we are dealt with in this spirit, we can help to build up the business of the country upon *sound and permanent lines.*"

The then attorney general expected "fruits," for he alluded to "frank negotiations in respect to these matters" which "compel the belief that what you propose will be carried out in good faith; and it seems to all clear that such action on your part will establish conditions under which there will be full opportunity throughout the country for competition in the transmission of intelligence by wire." The then attorney general, however, made it clear that the administration would not abate "insistence that the statutes must be obeyed"—that there must be harmony with the law. Evidently there had not been previously—else "frank negotiations" and the proposition from the A. T. & T. vice-president were unnecessary.

Indeed, the president of the A. T. & T. Co. was quoted at the same time as having given a statement at his Vermont home in which he said there had been "protracted and exhaustive discussion between the attorney general and our company," and that the new departure indicated in the promises above quoted was, for the purpose of adjusting the operations of his company "to the law as *understood* and *interpreted* by the attorney general."

It may be said that all of this is ancient history—but it is history, just the same, and it is worth while, at times, to consult and consider history.

Have the fruits of that "protracted and exhaustive discussion" seemed the natural, logical outcome thereof? If not, we still have to "know" those who participated in such discussion and tendered promises thereafter, by what they did and are doing, rather than what they said.

Illustration: In Michigan there is now a proposition for "division of territory" between the Michigan

Map of Lower Peninsula of Michigan, Showing Competitive Conditions of Long Distance Telephone Lines Prior to 1911. Code—Black Shading, Exclusive Michigan State (Bell) Company Territory. Balance of Territory, Independent and Bell in Competition.

State Telephone Co., one "of the other companies in what is known as the Bell System," and the Southern Michigan Telephone Co. The Bell Co. is to "acquire directly or indirectly through purchase of its physical property" of part of the Southern Michigan Company's system, which was distinctly competitive, by selling to that company some of its own property. And in the territory affected, competition eventually will be diminished, or ended.

Michigan Independents have had experience with such sales mergers, divisions, etc., in the past, and always to their detriment; and, as they believe, to the very considerable disadvantage of the public. Some years ago competition ended in Lenawee county (Adrian is the county seat) where a third company took over the competing plants. It is practically dominated by the Bell company. Later the Bell bought the Independent company in northern Michigan in Kalaska, Antrim and other

counties, after a permit from the Michigan Railroad Commission, said permit attempting to provide for continued service to and from that territory for the Independents; but that competition has practically ceased—points which at our time had many such connections every month now have none! Later southeastern Michigan, Detroit and vicinity, was bought by the Bell company again under the formal permit of the Michigan Railroad Commission, after definite written processes by the buyer, and again competition has very largely ceased, higher rates for a service which the Detroit *Free Press* has editorially declared to be "attrocious," are in prospect, and the practical results are far from satisfactory to those most affected.

But these changes in Michigan, all but the "Southern Michigan" deal all occurred before that notable letter of December 19, 1913, and so are germane only as illustrating what may be expected (indeed is already realized) in the "Southern Michigan" and like territories in Michigan and other states.

In this division of territory the Southern Michigan Telephone Company, if it be finally accomplished, will

Map of Lower Peninsula of Michigan, Showing Changes in Competitive Conditions at the Present Time. Code—Black Shading, Exclusive Michigan State (Bell) Company's Territory. Heavy Black, Independent Companies Affiliated With Bell. Balance of Territory Operated by Independent and Bell Companies in Competition.

practically be confined to the territory in Branch and St. Joseph counties, and will surrender. Hillsdale and other territory to the Michigan State Telephone Company (Bell). It is apparent that competition in the affected territory will absolutely cease, so far as the Bell and the Southern Michigan Company can produce that effect; that is what the "division" is for, and has been very largely accomplished.

It cannot be pretended that this property was acquired or held in the interest of the Bell Co. before December 19, 1913.

Further, it should be stated that other Independent interests in Michigan, through the medium of the "Michigan Independent Telephone and Traffic Association," owned by more than a score of Independent companies, began litigation to prevent such "acquirement" and that that litigation is yet pending—appealed to the Supreme Court of the state. Notwithstanding this fact, and condition, the parties principal to this bargain have completed the physical transfers and control of the properties affected!

Do these fruits seem consistent with the promises and comments above? "By their fruits," etc.

And there are other negotiations in progress in Michigan and other states. Indeed the newspaper "clippings" from the country as a whole show that similar compliance with the promises made are in progress in 16 states, affecting more than 100 exchanges!

One of the latest of these negotiations has an especially important significance. It affects independent plants in West Virginia and Eastern Ohio, on each side of the Ohio river where the companies affected are most evidently engaged in inter-state commerce. It appears that certain state authorities have already been approached for permission, but since by definitive action of Congress, telephone companies, those engaged in interstate commerce, are under the control of the United States Interstate Commerce Commission, it would seem that the United States permission would be requisite. Is the United States to be ignored? And will the attorney-general's department ignore the negotiations?

Should such a promise as that of December, 1913, have been required? Evidently the President and the then attorney general thought so; else they had not been parties to "protracted and exhaustive discussion" —had not welcomed the promises of the vice-president in formal letters.

If the promise was necessary, and properly to be so welcomed, are the "fruits" consistent with it?

If not, what is the present duty of both the government of the country and of those whose interests are materially affected by such "fruits"?

Is there not occasion for concerted action to the end that the then attorney general's desire "to co-operate with and to promote all business conducted in harmony with law" shall be realized?

One of the purposes of the Independent Telephone Association of America is to assist, strenuously, in securing harmony with law in the telephone business, and "full opportunity throughout the country for competition in the transmission of intelligence by wire."

And the assistance of all of like purpose is urgently requested.

Benefits of Extensions

The Stromberg-Carlson Telephone Manufacturing Company, Rochester, New York, has prepared for the use of telephone companies a unique folder, in which is explained in an interesting manner the many benefits an extension telephone provides in the residence.

The folder is well illustrated. On the front page a young lady is depicted using the Combination Phone —this illustration is striking, and will, without doubt, prompt the recipient of the folder to carefully read what is inside of it.

On the inside of the folder is also shown a man using the Combination Phone in bed. This picture tells plainly how easy a matter it would be to call up the doctor in case some member of the family were taken ill in the dead of the night.

The Stromberg Company will furnish to any telephone company interested a quantity of these folders with the name of the company imprinted thereon. It might also be added that these folders may be mailed out with statements to subscribers.

When Telephone Shopping Was Supreme

Conditions During the Three Day Street Car Strike in Chicago

PROBABLY the greatest test in the history of the Chicago Telephone Company happened Monday, June 14, and Tuesday, June 15, when every surface car and elevated train ceased operation as a result of the carmen's strike in Chicago.

Thousands of workers were unable to get from their homes to work. Telephone traffic increased immediately from 50 to 300 per cent. Whereas the normal number of calls per day averaged 2,000,000, at the end of the first day's strike a total of 3,000,000 calls had been made.

In order to cope with this extra heavy traffic, the company found its greatest problem in conveying its operators from their homes to their respective exchanges. three classes, composing Class A, including those operators who lived within walking distance of their exchanges; Class B, consisting of those operators who could travel by steam roads, and class C, comprising those who required special conveyances.

Just prior to the strike, for several nights, nearly 700 operators remained in the loop district where special arrangements were made in Chicago's fireproof hotels to house the downtown operators for an emergency call. When the strike was officially called, the company's operators were ready instantly and the very first obstacles thus eliminated.

The situation also brought about a most serious and interesting crisis among shoppers in the loop department

PHONE CENTRAL 100
The Chicago Tribune
The World's Greatest Newspaper
The Street Car Strike Finds Us Prepared
Every Household Can Make Its Regular Purchases Without Inconvenience or Loss of Time
The largest and most completely equipped Telephone Switchboard in any Retail Establishment in the world has been especially organized for this emergency and will give prompt and satisfactory service.
A corps of picked salesmen and saleswomen—specially trained for Telephone Order work—is now on constant duty, prepared to receive orders by telephone, and ready to fill them in any section of the store, efficiently and accurately.
Our comprehensive motor car service will make prompt free delivery of all telephone orders to any part of Chicago or surrounding suburbs.
You are cordially invited to take advantage of this Service.
To do so—Telephone Private Exchange 1
MARSHALL FIELD & COMPANY
Regular and Emergency Service
for the placing of Tribune Want Ads by telephone has been undisturbed—and such telephone service will continue daily—because Tribune ad-takers will be regularly at their desks to receive Want Ads from telephone subscribers who are unable to reach our main office in person.
Bell System
A Message to Telephone Patrons
CHICAGO TELEPHONE COMPANY
Mandel Brothers
Mandel ideal service
shopping by telephone or mail.
Call Private Exchange 10
—any hour—day or night
THE FAIR
Let The Fair Help You Do Your Telephone Shopping
Extra telephone operators and an added force of personal shoppers are at the service of those who cannot conveniently come downtown.
Call Private Exchange 3
Mothers! Phone Private Exchange 8
for those novelty suits and all boys' wear
Sport Suit
Garden Suit
At McClurg's
Telephone Your Order
A. C. McClurg & Co.
TELEPHONE
PRIVATE EXCHANGE
Rothschild & Company
MARSHALL FIELD & CO
INTERIOR DECORATIONS & FURNISHINGS
You Can Order This Furniture by Telephoning Private Exchange One
THE HUB
Henry Clyman & Sons
CARSON PIRIE SCOTT & CO.
Telephone Private Exchange 2

Advertisements That Featured Telephone Shopping During the Chicago Street Car Strike.

If it had not been for the farsightedness and efficiency of the operating company's officials but few of the operators would have been ready to answer the increased calls and without a doubt the Chicago public would have had a forced opportunity to realize still more emphatically the vital necessity of the telephone. On the contrary, however, the company's plans were well made and the gigantic problem of transportation was well overcome.

In order to convey the thousands of operators to their exchanges, the traffic department was equipped with 150 of the company's large motor trucks, besides many smaller passenger vehicles. So thoroughly were preparations made that the many operators were taken to their posts of duty with practically no extra expense or inconvenience to them whatever.

To do this efficiently, the operators were divided into stores. Newspapers and advertisements impressed upon the public the convenience of "shopping by telephone." Practically every one of the large stores trained special corps of telephone order clerks and many purchasers who found it impossible to get to the shopping district gave their orders over the telephone and were supplied as usual and without inconvenience. Department store managers stated that their telephones were kept busy constantly and in checking over the receipts of the first day they found that the volume of trading done showed practically no decrease, all, of course, because of switchboard shopping.

Telephone utilization was made dominant at once and the Chicago public had a splendid opportunity to realize its utility and also to appreciate the efficiency of its operating company.

Wireless as an Adjunct to Exchange Work

How the Pittsburgh and Allegheny Telephone Company Uses Ether Waves

BY LOUIS MUHLHEISLER

A FEW years ago wireless aerials were few, indeed, so few that the readers of this article, no doubt, remember when they first saw one; but having seen pictures of them in magazines, knew what they were on first sight.

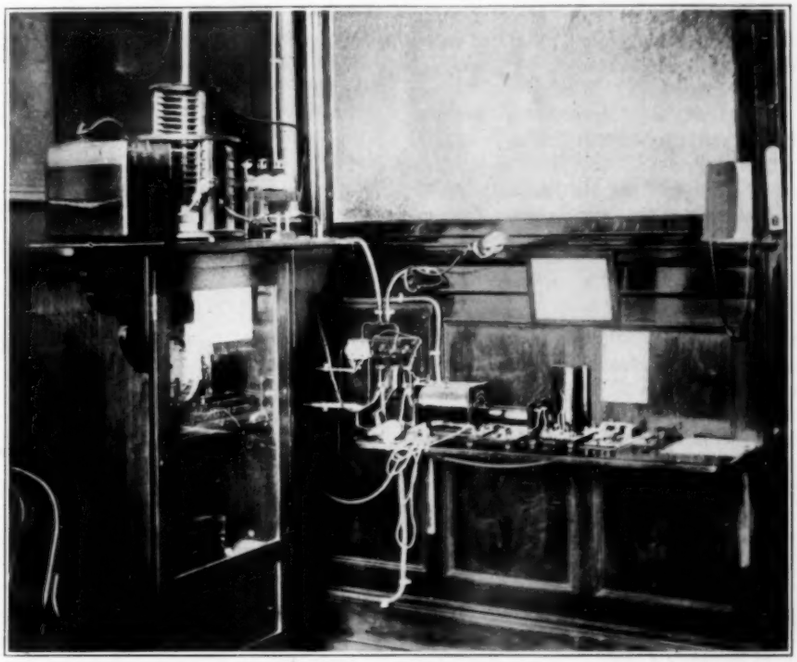
There are now more than 200,000 wireless amateurs in the United States; and wireless aerials, which range all the way from an insulated wire attached to a broomstick stuck into a chimney, to quite elaborate aerials costing thousands of dollars and capable of establishing wireless communication with distant places, are becoming common.

When one becomes interested in wireless and has mastered the code and gotten some kind of a receiving apparatus together and working, one is frequently reminded of what one would be missing by not having such a wireless station, for during many hours of the day the air (so-called) seems to be alive with wireless messages.

If a rude, untuned wireless receiving-set of any kind is set up on, or near, any civilized coast in the world, a babel of wireless signals will be heard. If, on the other hand, a carefully-tuned wireless receiving set be used, the number of stations heard at a certain adjustment of the instruments will be greatly limited or reduced to a few. Were the receiving instruments connected to a large aerial, say 600 feet high and long, the great Transatlantic stations would be heard. Using an aerial, say 100 or 200 feet long, you would be better provided for receiving from land and smaller shore stations; while with a smaller aerial, under general conditions you would be more nearly in tune for working with amateur stations and the smaller commercial or long distance stations. It would still be possible, up to certain limits, however, to tune a small aerial for long distance with loading inductance.

Returning to local wireless conditions, it is probably due to the fact that wireless between ships at sea and between ships and shore, as well as across bodies of water, is of such infinitely greater value than between two points on land, that we have no large commercial wireless stations inland in this immediate vicinity; although there are quite a number located at Erie, Buffalo and other points on the Great Lakes. A good example of this is where a powerful wireless station was recently installed on the Seward Peninsula, Alaska. During eight months of the year this place, because of ice floes and other Arctic conditions, is effectually cut off from the rest of the civilized world, save for this wireless connection. During the first year the station was in operation more than 1,000,000 words were transmitted.

It is very interesting and valuable to know just what can be expected of, and accomplished with, a certain set of instruments. The writer, using a brass bed and concealed electric light wiring (which was not in use) for an aerial, has many evenings for weeks received hundreds of wireless messages, and with an aerial formed of insulated wire attached to an attic ceiling, received, continuously for months without interruption, the daily time signals and weather reports from the government station known as Arlington, near Washington, D. C.



Wireless Station of the Pittsburgh and Allegheny Telephone Company. Photo by the Pittsburgh Industrial Development Commission.

More than a year ago there was formed the Wireless Association of Western Pennsylvania, which later consolidated with the Western Pennsylvania Radio Society under the name of the latter with headquarters in the Miller building, 530 Fernando street, Pittsburgh, about which time the Pittsburgh & Allegheny Telephone Company installed a complete wireless station in the chief engineer's office. From this station, usually called the P. & A. station, receiving tests have been made with Arlington, Sayville, L. I., Key West, Cape Cod and other commercial transatlantic stations.

The photograph is a view of this apparatus. All of the transmitting apparatus, except the sending key, is enclosed in the sound-proof case, while the receiving apparatus is placed on the shelf. The aerial is 170 feet long and 100 feet high, composed of four vertical and four horizontal No. 10 copper wires insulated with high voltage insulators. The ground wire is composed of 125,000 C. M. stranded copper rubber-covered cable.

The Radio Society is composed of persons owning or operating wireless apparatus and has about seventy-five members, forming branches or clubs variously located in adjoining towns or cities, collectively forming what is known as the Central Organization of the Western

*Chief Engineer, Pittsburgh & Allegheny Telephone Company.

Pennsylvania Radio Society. The Central Organization holds quarterly annual meetings in the Miller building.

Frank M. Weaver, also connected with the telephone company, and who organized the society, is president; Hunter J. Lohman of McKeesport, vice-president, and W. K. Thomas, secretary-treasurer. As to organization, the officers of the various branches constitute a board of directors of the Central Organization who look after the welfare of the society. The Central Organization is governed by a constitution with local by-laws to suit local conditions of the various branches and the whole organization operates automatically, somewhat similar to a small government.

Mr. Weaver, who has a completely-equipped high-power wireless station at his home a few miles down the Ohio river from Pittsburgh, also equipped a similar station for his father at Latrobe, Pa., about fifty miles east of Pittsburgh.

Practically all the apparatus in the Fernando street station was made in the Pittsburgh & Allegheny Telephone Company's shops in the Miller building.

A number of experiments have been made with the wireless telephone. One of the members, Mr. Murray, located in Sheraden, holds the record for distance, using the spark of an ordinary 4-ohm buzzer for sending messages. He has sent messages in this way more than eight miles, using nothing but the buzzer and several cells of battery connected with his aerial, which is 100 feet long and 55 feet high.

The society is always glad to hear through its secretary, from any person interested in wireless.

—

WHAT THE PITTSBURGH INDUSTRIAL DEVELOPMENT COMMISSION SAYS ABOUT IT.

Using the wireless in a business that is built entirely upon wires seems an anomaly. But that is what the Pittsburgh & Allegheny Telephone Company is doing. The telephone business, of course, depends upon wires. Without wires the telephone is useless, for invention has not yet evolved the wireless telephone in perfect form.

As a valuable supplement to the wire business, however, the wireless is a vital factor. The truth of this is attested by the fact that the Pittsburgh & Allegheny Telephone Company has developed a wireless organization as a distinct department of its business. The main station is in Pittsburgh. Eight branch stations are established at points in western Pennsylvania, eastern and central Ohio and parts of West Virginia—throughout the territory in which the company operates its telephone system. Trained operators, working the company's secret code, keep in daily touch with the big station in the Miller building in Fernando street, Pittsburgh. This plant is in charge of Louis Muhlheizler, the company's chief engineer, and his assistant, Frank M. Weaver. The most distant station in the organization is at Erie, Pa., a distance of nearly 200 miles.

The need for the wireless became apparent when a storm of wind and sleet last winter threw down poles and wires over so wide an area that Pittsburgh was almost completely cut off from the rest of the world for nearly a week. The telephone companies were paralyzed for several days. Repair gangs were sent from all the towns in the district but with no wires it was impossible to keep in touch with any of them. Reports, orders, requisitions for materials had to be made by messengers and these had to depend wholly upon trams to get about from place to place. Because of the loss of wire service the work of rehabilitating the telephone service was retarded for days.

When the company had recovered and was again operating normally a conference was held by the department chiefs to devise means to cope with any similar situation that might arise from the same causes. The wireless plan was adopted. A wireless organization was formed among the employes and equipment for the nine stations was installed. To guard against unpreparedness in an emergency it was decided to keep the organization in training by a certain amount of work every day. This plan has been carried out. The experience thus gained has been invaluable.

Now the company is ready. If another storm does the damage that was inflicted last winter the company can get into communication at once and continuously with every part of its system. The whole situation could be handled and directed right in the Pittsburgh office and the innumerable delays of last winter obviated. Practically all the apparatus in the Pittsburgh station was made in the company's shops in the Miller building.

In connection with their professional interest in wireless as an aid to the telephone business, Messrs. Muhlheizler and Weaver have encouraged the large number of young amateur wireless operators who have set up stations in western Pennsylvania. Largely through their efforts the Radio Society of Western Pennsylvania was organized. Practically every person interested in wireless has become a member of this organization.

Foochow Telephone Service

Consul Albert W. Pontius, Foochow, China, reports that there are two telephone companies in Foochow—one small foreign-owned exchange connecting only the firms and residences in the foreign quarter at Nantai, and one native-owned exchange operating in Foochow city and all immediate suburbs. The foreign-owned exchange is operated and controlled by a local German firm. The switchboard provides for but 50 connections. There are 40 subscribers, an annual rate of $70 being charged for either the desk or wall instrument. (The figures quoted herein are in "chopped" Mexican dollars, 100 local dollars being equivalent to about $40 United States currency.) The exchange has only 3 miles of wire, the line being of the single-wire system.

The Chinese-owned exchange is known as the Fukien Telephone Company. The company began operation in 1903 and is capitalized at $45,000. The property is valued at $60,400, and during the past year a profit of $7,400 was realized. The demand for telephone service through this exchange has gradually increased, and the subscribers now number 320. The length of wire in use is 140 miles. Six switchboards have been purchased, four being of British and two of Norwegian manufacture. With the exception of one 200, the switchboards provide for connections of 100 each, and five of the switchboards are in use at present.

Most of the telephone supplies have heretofore been purchased in England, a fair amount having also been imported from Germany and Norway. The subscription rate for the ordinary wall instrument is $60 per year, and for the "microphone" style $72. The telephone service of the native exchange has greatly improved of late, and the company is now installing the double-wire system. There are three branch exchanges, but one will be dispensed with upon the completion of double-wire installation. The company at present employs one Japanese engineer in addition to its native staff.

The Inside of the Chicago Situation

What the Promoters and the Politicians Have Done to the Chicago Independent Company

BY ARTHUR KNEISEL

THE history of Independent telephony in Chicago as an operating proposition is so interwoven with unsavory episodes that, in a discussion of its present status, one hesitates to dwell at any length upon that period prior to February, 1909. There is little to be gained by reviewing the allegations of fraud with their subsequent indictments which circulated about the time of the first franchise in 1899 and the first amendment to the grant in 1903. A summary of the important historical events is of interest. The franchise granted February 20, 1899, to the Illinois Telephone and Telegraph Company made no mention of tunnels aside from a statement in the first section to the effect that "permission and authority be . . . hereby granted . . . to construct, maintain, repair and operate in the streets, avenues, alleys and *tunnels and other public places in the City of Chicago,* and under the Chicago River and its branches . . . a line or lines of conduits and wires, or other electrical conductors . . . to be used for the transmission of sound, signals and intelligence by means of electricity or otherwise." In the second section this ordinance stated, "All such line or lines of wire, or other electrical conductors (except those passing through the tunnels), shall be placed under the ground with that portion of the city bounded on the north by Fullerton avenue . . ." These two statements were evidently interpreted by the Illinois Telephone and Telegraph Company as a license to begin the construction of a tunnel system, for the next mention concerning tunnels in city ordinances appeared in the ordinance of July 15, 1903, Section 1, which read in part: "That permission and authority are hereby granted . . . to construct, maintain, repair and operate in and *through tunnels which have been constructed under the terms of an ordinance of February 20, 1899,* or which may hereafter be constructed . . . not only wires and electrical conductors as provided in said last mentioned ordinance, but also any appliance or apparatus for the transmission or transportation of newspaper, mail matter, packages, parcels or merchandise." It seems that from the very beginning the promoters of Independent operating telephony in Chicago played the game in a peculiar and under-the-board method.

The first franchise provided for a penalty of $50,000 in case the company failed to have in operation a telephone exchange of 20,000 bona fide subscribers within a period of five years, and further provided that, in case of the failure to pay this penalty, the company should forfeit to the city all its rights, plant, wires, poles and conduits. This ordinance of 1899 also provided that the entire plant, conduits, wires and poles should be forfeited to the City of Chicago in case the telephone company, or its successors, should sell out to or enter into any agreement with any existing telephone company which would tend to make competition in the city inoperative. The franchise of 1913 modified one of these forfeiture clauses and provided for a forfeiture in case the company failed to construct and have in operation a telephone system serving 20,000 subscribers within five years of October 1, 1903, or if at any time after that date it should cease to operate a telephone system serving 20,000 bona fide subscribers. The phrase "serving 20,000 bona fide subscribers" has been the subject of considerable controversy during the past few years of the fight which is being waged to prevent the sale of the automatic system to the Bell company. On November 9, 1903, the Illinois Tunnel Company was organized and this company acquired all of the rights and property of the Illinois Telephone and Telegraph Company by assignment. Five years after October 1, 1903 (October 1, 1908), the telephone company did not have the requisite number of subscribers and was granted an extension of time until October 8, 1909, as the date prior to which it must have installed a system adequate to serve 20,000 subscribers. On June 28, 1909, the time was again extended and the company was given to June 1, 1911, to comply with its part of the contract. This time extension was granted principally because of some delays in construction, which delays the telephone company claimed were caused by the city. On December 1, 1909, the entire property of the Illinois Tunnel Company was put into the hands of a receiver, and operated under receivership. On May 2, 1912, a master's deed to the property was given to the Chicago Tunnel Company, which had been organized March 30, 1912. This company received a system consisting of one exchange, located at Fifth avenue near Monroe street, having a maximum number of approximately 6,000 telephones, having grown to that number from approximately 3,500 bona fide subscribers, under the receivership. The final capacity of this system was approximately 10,000 lines. The construction work up to this time was done by the Illinois Telephone and Telegraph Company, the Illinois Tunnel Company, Illinois Telephone Construction Company, this latter having been organized in 1899. It is practically impossible to determine when these various companies ceased operations, for all of their books were destroyed or lost, leaving no record of the work they did. The Illinois Telephone and Telegraph Company is still in existence as the operating company of the Chicago Utilities Company, which at present owns the securities and assets of the system.

The receivers of the Illinois Tunnel Company began the construction of the present automatic telephone system in Chicago in March, 1910. This was about the time that Harriman and Armour money became interested in the project and from this time on the work was pushed and an earnest attempt seems to have been made to comply with the ordinance. Many changes in the art had rendered the old equipment used in the Monroe and Fifth avenue exchange obsolete and the greater portion of it was not used in the reconstruction. Those portions which were used were put in first-class shape.

The construction work on the new plant was undertaken by Joseph Harris of the Automatic Electric Company, the contract for the work being assigned to an allied company known as the Subway Telephone Construction Company, of which Joseph Harris was also president.

Attempts were made at various times to determine the number of bona fide subscribers connected to the automatic system in Chicago. In 1911 William Carroll, city electrician, rendered a report which was incomplete due to the lack of necessary funds to complete the investigation. As there was but little money available for this check naturally no comprehensive study of the situation could be undertaken and practically all the checking which was done consisted in calling up subscribers

in the directory of the telephone company, checking off those who answered and recalling those who did not answer four or five times at different times during the day; if no response was received, they were considered as doubtful to be investigated later. In 1912 the Everitt Audit Company made an investigation costing $30,000, the purport of whose report was, that the automatic system had secured the 20,000 subscribers by ordinance by October 10, 1911. It did not attempt to define the bona fide subscriber and consequently made no attempt to state how many of these were bona fide subscribers. It was held by the corporation counsel that the courts would not sustain the forfeiture of the company's telephone plant and rights under the ordinances due to delays in construction occasioned by interferences on the part of city officials and delays in granting the necessary permits for working in the streets.

In July, 1913, the Chicago Tunnel Company entered into an agreement with the American Telephone and Telegraph Company whereby the latter agreed to purchase all of the telephone property, wires, plant, etc., exclusive of the Tunnel property for $6,300,000. This agreement also provided that the Bell company be granted the right to occupy space for wires and cables in the tunnels of the Tunnel Company, but the number of cables was limited to 18. The entire agreement of sale was contingent upon the granting of permission by the city council, the State Utility Commission, and the United States Government, and that such a transfer was not contrary to existing laws.

The city council then ordered the city electrician, Ray Palmer, to make a valuation of the automatic telephone property and to determine what portion of it could be used by the Chicago Telephone Company and what the value of such portion of the property would be. This valuation showed the depreciated value of the plant to be about $3,600,000, and did not allow for $1,092,632.35 of intangibles listed in the valuation submitted by the Chicago Tunnel Company. The report of the city electrician estimated the total present value of the property which would be of immediate future use to the Chicago Telephone Company as amounting to $1,177,100 exclusive of repair parts, stores, etc., and further estimated, on the assumption that the automatic service would not be continued indefinitely, that the amount of property which could ultimately be used to advantage by the Chicago Telephone Company amounted to $1,875,500.

B. E. Sunny, president of the Chicago Telephone Company, appeared before the council committee on gas, oil and electric light, and stated, in response to questions, that his company had not fully determined upon what policy it would pursue relative to operating the plant in case the sale was consummated. He stated that the Chicago Telephone Company desired to place a charge of $4,000,000 against its capital account if the sale was permitted.

The ordinance which was drawn to permit the sale of the automatic property to the Bell company has been in the hands of the committee on gas and electric light for over two years, the subject of much discussion and bitter controversy. This committee has been accused at various times of willfully delaying action in the matter, but those best informed on the subject have long recognized the injustice of such a charge. The question being such an extensive one, which called for more or less technical information and detailed information relative to its many phases, it would have been the height of folly for these gentlemen to have acted hastily. One feature which has interfered with a connected consideration of the question has been the changes in the personnel of the committee. Usually when the numbers of the committee have been educated in the intricacies of the situation, council would adjourn for the summer or there would be changes in its membership and the process of education would begin all over. The committee has at all times earnestly desired to get the true facts connected with the matter and seems unwilling to take final action until it is sure of its ground. Alderman C. E. Merriam has been particularly active in trying to safeguard the interests of the telephone-using public of the city.

The council itself has become impatient and attempted to find some way of settling the question. In October, 1914, the council ordered, upon recommendation of Ald. Cullerton, that the Commission of Public Service make a count of the telephones connected with the automatic system to determine whether it was serving 20,000 bona fide subscribers. While the results of this investigation have not become entirely effective, it was so comprehensive that the question of automatic subscriber counts in Chicago should be settled forever. This report did not state how many "bona fide subscribers" there were, for the Department of Public Service had been unable to find a definition of the term "bona fide subscriber." It, however, gave all the information which could be used in the framing of a definition by the courts should this become necessary. The investigations made in connection with this count disclosed some very interesting facts, which will be discussed in the next issue of TELEPHONE ENGINEER.

(To be continued.)

The Mix and Genet Telephone Construction Company has declared a dividend for the year 1914, amounting to 12 per cent and payable in four quarterly dividends. The incorporated capital of this company is $1,250,000. This dividend is paid to the stockholders, contrary to general opinion that conditions would make it necessary to turn this profit back into the capital fund. The company explains in its report that it was able to declare this dividend through its action in adapting the resources of the company quickly to new conditions and going into the production of war materials from which a good profit was reaped.

Among the specimens of publicity literature recently issued by the Leeds and Northrup Company, Philadelphia, are "The Measurement of Conductivity of Electrolytes (a 44-page booklet of considerable scientific value), "A Universal Lamp and Scale," and an all stock list and supplement offering a number of bargains. These are all valuable additions to the stuff on the telephone man's desk.

The government of Costa Rica maintains a small system of telephones for its official use, and a private company maintains a telephone system that connects the larger cities of the tableland. There is also telephonic communication between the capital and both ports—Liman and Puntarinas.

The Home Telephone Company, San Diego, has sent a representative to appear before the California State Railroad Commission and request concessions of that body in putting into effect new ideas in the development of the Home plant and service for the benefit of subscribers in San Diego.

The Operating Employe's Interest in Efficiency

Showing a Tendency to Meet the Employer More Than Half Way

Requirements of an Ideal Operator

By Alberta May Edwards, Head Day Operator, Roodhouse, Ill.

A SHORT time ago a school of instruction for telephone operators was held at Carlinville by Mr. Vivian, secretary of the Independent Association, at which time the question was asked, "What are the requirements of an ideal operator?"

There were a number of requirements suggested, the first one of which was good character as the foundation, which should be the foundation of every success in life. An efficient operator has to be made, not born. As in every other line of work in the successful business world, it takes months of training, with the standard of perfection held up before them, ere they can be called efficient in all the details of the telephone business.

Therefore, how essential is it that we have something on which to build. Building a successful life in any line of business and trying to put the essential things, the things that go to make a success of that business into that life, and building without a good character is like erecting a fine building and putting everything into that building to make it beautiful to the eye and lovely to look upon, and building it without a foundation.

When the testing time comes, as with the building, so the life; all the years of work and study in building that life, all the years of patience in teaching them to grow into what you want them to be will be wasted in a moment of time and all your efforts will have been in vain.

Then a telephone operator should first have good character because it is a credit to the company with which she works to keep girls of good reputation. It has been said that a man can come into a town for the first time, call up the telephone operator, and draw his own opinion of what kind of a town it is by the way in which the operator answers him. Character will show itself by the way in which you speak, in the very tone of voice; therefore it is essential that the telephone companies hire girls of good reputation.

Then the next requirement given for the ideal operator was patience. That brings us right back to character. If she has good character she will cultivate patience, for patience is a mark of character, which shows itself in every action of the well-bred girl. How that little word "patience" has to be made an element in the operator's life from day to day, during the long hours in which she sits in her place, meeting the commands of the public and performing the duties which are required of her in her work of serving the company by which she is employed. Then the next essential given was a sweet disposition. In that I would go back to the first, for as I said of patience, a sweet disposition would be only another mark of good character.

And if we have good character together with patience, I think there would be no question about the sweet disposition, for a sweet disposition would come from patience and the practice of it from day to day, for all good things come to those who wait and who strive for them. Have patience to deal kindly with the subscriber who gets "off his base," caring not what he says, so long as you know you are treating him fairly and meeting the requirements of your company.

Have patience to perform your work in the best possible manner, no matter how tired or discouraged you become, and I think the sweet disposition will take care of itself, and you will not have to trouble yourself about how you acquire it.

Then the next essential was a moderate tone of voice. Character would show itself in the very tone and expression of the voice, therefore a moderate tone of voice would be another mark of good character.

An operator should train her voice to be low and sweet, because in talking over all local or long distance lines the voice will carry further if the tone is low than if high, and she must please every one with whom she

Alberta May Edwards, Roodhouse, Ill.

Vivian Graves, Dixon, Ill.

Mrs. Katherine Kirby, Columbus, Ohio.

comes in contact, therefore she should train her voice to be sweet and pleasing, and if she feels any irritation be very careful not to show it in her manner of dealing with the patrons.

Then the next essential suggested was clear pronunciation. She should not only have a moderate tone of voice, but she should make every word clear and distinct, and not become mechanical and run her words together. Every word should be said slowly and apart by itself if she would make the best impression and give the best service.

Then it was suggested that she have courtesy, which would be, as almost every other requirement, also a mark of good character. Under no circumstances will the well-bred girl lose her temper in such a manner as to be rude to others, but will be obliging, always striving to please, causing the subscriber to want to call again, making him think she is giving him the best possible service it is in her power to give.

Then aside from these it was suggested that she have good hearing and good health. Otherwise she would not be able to meet the requirements and demands of her company in all the phases of the work. It is expected of her that she will be ready whenever called upon, and if she has good health it better enables her to have a sweet disposition, as ill-health often causes one to be irritable and not have a fit disposition to operate a switchboard.

The last but not least requirement suggested was ambition, which is very essential to the success of the ideal operator. She must be ambitious to work, ambitious to be there at the proper time, ambitious to perform her work in the best possible manner, ambitious to please the company which is paying her for her services, and also ambitious to please the public. In short, she must please everyone with whom she comes in contact at all times, making her life a continual life of service to company anl public, always being ready to live up to the rules which are laid down for her to follow, striving to reach as near as possible the standard of perfection, ere she can be called efficient in all the details of the business. An ideal operator will never fail to satisfy her company and please all who hear her voice.

Operator's School at Dixon Illinois

THE best attended telephone meeting ever held in northwestern Illinois was that under the auspices of the Dixon Home Telephone Company, held at Dixon, May 11 and 12. More than 100 were enrolled in the two days' session. W. S. Vivian, secretary of the Independent Telephone Association of America, had charge of the meeting, which was primarily in the interest of instruction to the operators in attendance upon the meeting. Incidentally a large number of the men connected with the various neighboring companies made it an occasion of good-fellowship and for discussion of matters relating to their part in the various telephone businesses. Mr. Vivian was at his best in charge of the school. The greatest interest was shown by both operators and men attending the meeting. No systematic course of instruction has ever been attempted before in that part of the state, and it is believed a great deal of practical good will result from the meeting.

The Dixon Company is one of the Hawley and Cheadle properties with a most remarkable development in the territory covered by it. The Dixon exchange includes almost 2,400 subscribers, 550 of which are rural within a radius of a few miles. The last census of Dixon gave it a population of a little more than 7,000 people. The ratio of development to population is probably as great as can be found anywhere in the country. The company has outgrown its present quarters and is making plans for a commodious fireproof exchange building on a lot recently purchased by it for that purpose. It is one of the most successful telephone properties in the country.

On Tuesday evening the home company was host at a launch ride up the beautiful Rock river, and a chicken dinner at the Sheffield Hotel in Grand De Tour. More than seventy persons enjoyed this delightful trip.

Manager Louis A. Pitcher, Chief Operator Clara Haas, Assistant Chief Operator Vivian Graves, Bookkeeper Margaret Reilley and other employes of the Home company gave careful attention to the comforts and needs of the visitors and contributed much to the enjoyment of the occasion.

The value of the meeting to the various companies interested was so apparent and so great that a further meeting in the near future was unanimously decided upon, and a committee was appointed to make the necessary arrangements for such a meeting, at which it is expected there will be an even larger attendance.

As a result of the meeting a number of papers were prepared by operators attending, and Mr. Cheadle volunteered to award three prizes of $5, $3 and $2, respectively, for the best three papers. The prize-winning papers follow in their order:

What Makes an Ideal Operator

By Vivian Graves, Dixon, Ill.

ALTHOUGH I attended each session of the operators' school conducted by W. S. Vivian at Dixon, Illinois, that which interested me most was the discussion on "The Ideal Operator." Nineteen qualifications were enumerated, but it is my opinion that character, or morals, cover eighteen with health as the nineteenth. I would place honesty as the first qualification, then ambition, concentration of mind, education, knowledge and interest in the work, self control, patience, good nature, accuracy, quickness, loyalty, reliability, punctuality, faith, neatness, and the well-modulated voice, all of which go to make up the character of the ideal operator.

An ambitious girl, anxious to do what is right by herself and all concerned, capable of concentrating her mind, and with a fixed ideal, may attain not only efficiency in her work but a truer and broader womanhood. We know that it is worth while to be conscientious—to strive to do the best that we can at all times. The goal is success. We cannot attain the goal in each instance, but it is well to aim high for, as Billy Sunday once said, "It is better to knock a few feathers from an eagle than to splinter a barn door."

In reviewing the qualifications I find I am possessor of but few and have decided to take Mr. Vivian's advice to "get busy." In seeking to better myself and existing conditions, I shall start with punctuality—not because I think it most important, but because I need to reform along that line. I do not intend this as a confession of my faults, but neither do I intend to inconvenience my manager by making it necessary for him to "present me with an alarm clock."

I know that the good I derived from the school will not only help me at present but also the future. In his delivery Mr. Vivian made facts so plain that I could not help but feel my deficiencies. I think we each realized that action was necessary. As a result we have organ-

ized and are going to take up the work more thoroughly, which I am sure will lead to greater and better service.

Trying to Be an Ideal Operator

By Florentine Keenan, Dixon, Ill.

ON Tuesday and Wednesday, May 11 and 12, I attended four sessions of the operators' school held at Dixon. The instructor was of pleasing personality, with a fine voice, and, from what I heard later, an excellent example for others.

Before going to this school I thought I was as good an operator as another one, and I wouldn't need to go. Well for me that I went. I have changed.

Talk about remorse of conscience! I was sitting in a front row, and of all the "caps that fitted me!" Of course I wore them, and am glad to say I am feeling better. I have been in vocal training, and of course a sweet voice follows, but you would never know it if you heard me sometimes.

We were told what a credit and honor it is to the company to have an operator with a shining character, one who can be trusted, and, above all, to know that by this one operator the company will prosper and be praised. It is a great thing to have a responsibility placed upon anyone, and surely an operator should realize that, because a person as a rule must have good qualifications before this is placed upon them.

Let an operator's mind be upon her work, and she won't have to worry whether the manager is near or far. He can rest assured that that girl is doing well for the company. But let her be thinking of some dress or party; she doesn't test her line, may have been out late the night before, her head aches, and her voice is cracked. Then the manager will soon stay in the office. I think if an operator has the education one should have and also the knowledge, she will know that her mind must be upon her work.

Even though an incoming operator doesn't answer me, I am going to trust in her and have patience with her, because "Patience covers a multitude of sins." A neat, cheerful operator will always appeal to the subscribers. This is one of my resolutions, which I broke but am starting over.

Seated one morning at the switchboard, about six twenty-five, I was as happy as a singing lark. My subscribers were very busy, and so was I. So I forgot to say please, and also to repeat my number. Just then someone said, "Florentine, I thought you were going to reform." What a feeling came over me! I said, "Oh, I forgot." I have begun again.

Mr. Vivian, I wish to thank you personally for your good advice, and hope I will hear you again. You may rest assured that after a time in Dixon you will have an "Ideal Operator."

The Operators' Convention

By Madge Hogan, Dixon, Ill.

THE operators' convention, which was held in Dixon May 11 and 12 was a great success in every way—that is, as far as I, myself, am concerned, and I think all the operators who were present will agree with me.

The different subjects that were discussed all proved to be very interesting. It is really hard to determine which was the most interesting, but after considering the many different topics, I think the most important one was "The Operator."

To be an operator sounds, as many people think, very simple; but after one discusses the many good traits one must have to be a "good operator" (which we all strive to be) we find it is not as simple as one imagines. The most important of these many traits, but the one which most of us take for granted, is that an operator should conduct herself at all times as a lady. This sounds rather queer, but when an operator is busy at her position, either through her actions or her words, she oftentimes does and says things that would lead them to think she did not possess the trait which is most required.

Another important point an operator should have in her favor is a good clear voice. Her voice is really the all-important factor of her work, for without it I really do not think she would be able to accomplish very much. If she is so fortunate as to posses a low, sweet-toned voice, you will find in most cases that she is even tempered and good natured, the latter being very essential in this line of work. No one cares for an operator who, when she answers their call, is cross or acts as though she is doing them a great favor and would be just as well pleased if they did not call in. An operator who is interested in her work—and I am sure all those are who attended our convention—will try at all times to be of help, to both her subscribers and her company; to the former by answering them promptly and at the same time courteously, to the latter by being, first, punctual; second, loyal; third, honest; fourth, ambitious.

I derived much benefit from the convention (I think our chief operator can tell you in regard to that) and will say, should the opportunity be mine in the future to attend another convention, I will surely be glad to do so.

The Interest of the Operator

By Mrs. Katherine M. Kirby.

MY first work in the telephone business was in the exchange of the Central Union Company in Mt. Vernon, Ohio. We had two hundred telephones and six toll lines. I was switchboard operator, also toll bill clerk and report clerk.

In June of 1901 I left Mt. Vernon to accept the position of chief toll operator for the Columbus Citizens Company at Columbus, Ohio. When I had been there six weeks I was given charge of the entire operating department, with about ninety girls to look after.

I will not say that experience was an easy one. The exchange was new, the subscribers and nearly everybody connected with the company were strangers to me. However, in a few days I was able to make a start toward bringing order out of chaos, and in a short time had a good organization of the operators, and I was able to give to the public such service that in a few months we were all proud of. I remained in charge of the exchange until the company adopted the automatic system five years later.

My present service with the Ohio State Telephone Company began about ten months ago.

During the early summer I had the pleasure of visiting a number of the independent exchanges in Ohio, and was much pleased to note the genuine interest the operators show in opportunities for more and better work in the telephone field. I believe the operators of the small exchanges show a keener interest in the rapid development of business than those of the large exchanges and I think the owners and managers of the smaller exchanges should let the operators know they appreciate the importance of their

position in the scheme for the improvement of service. The operator in the small exchange has opportunities for learning about equipment that the operator in the large exchange does not have; for my part I am sure what I learned about mending cords, connecting batteries, putting in fuses, etc., while working in a small exchange stood me well in hand when I attempted the care of an important position in a large exchange.

Employes' Meeting at Russellville

THE employes of the Russellville (Ky.) Home Telephone Company held their regular meeting in the company's main office June 4 at 8 p. m. After being called to order by Miss Ianthe McQuilken, chairman, Miss Beulah Lynch suggested that some form of organization would promote a stronger unity of feeling among the employes which would tend toward a higher efficiency; to this end she introduced the following resolution:

We, the employes of the Russellville Home Telephone Company, wishing to promote a unity of feeling, and believing that in union there is strength, do hereby ordain ourselves "The Home Progressive Club."

We are optimists and we believe in our company and ourselves, and the future, and with the co-operation and assistance of our manager, we have reasons to believe that with our mental, physical and financial strength combined, we can accomplish the goal of 100 per cent efficiency for this year throughout the entire plant.

The above resolution was adopted and signed by the following employes, who constitute the entire force of the Russellville Home Telephone Company: C. L. Obinchain, manager; Beulah Lynch, bookkeeper; Ianthe McQuilken, chief operator; S. P. Magruder, wire chief; Lucile Magruder, Olga Coffman, Tabia Obryan, Magdalen Traughber, Minnie Marion, Georgie Gray, David Gray, Stanton Nickens, Ludlow England, Susie Horner, Bertha Hardwick.

After the election of the usual officers, Mrs. Magruder had an original paper illustrating the correct and incorrect way of making toll tickets. She explained the confusion that may result in the accounting department from a slight error or omission on the part of the operator.

Miss Hardwick read an original paper entitled "The Proper and Improper Way of Handling Cords," in which she handled her subject in a capable way.

S. P. Magruder, the wire chief, read the following paper entitled "Service First":

SERVICE FIRST.

In meeting this evening and organizing our Home Progressive Club, we all have in mind the same purpose —Service. Why? Because we have nothing else to sell. The best definition I can give for service is "a labor performed for the benefit of others."

In performing this labor in the telephone field, we have only the future to draw us on and the past to correct our errors by.

In Russellville we have the brightest future for this year the Home Company has ever had here, and in turning to our past, we can surely say "We all make mistakes, but the wise employe never makes the same mistake twice."

Four years ago when I came to the beautiful little city of Russellville, the Home Company and its competitor had about the same number of subscribers. We all know how it stands today. What did it? Service First.

We are now working in the infancy of efficiency. When the roll call is made at the end of the year, can the operating and plant departments answer to the tune of 100 per cent? If we can not, we stand in our own light, for we are all working for the same end—advancement—and we would have to turn our back to our manager to ask for advancement if we have not advanced. Are we advancing forward or is it like the crawfish, walking backward?

If the plant department gives bad service it is impossible for the operators to satisfy the public. For instance, if we repair a telephone today and it works badly tomorrow, everyone who talks to or from that telephone will get bad service and it is natural for them to say, "It isn't my telephone; it was repaired yesterday. It must be that hateful operator who was on today." If we give "Service First" the subscriber will be glad to pay his bill and thereby perform that labor that will benefit you and me.

We are working in the grandest age the world has known, for the grandest company in the world, and through the best manager in the state, and for all the people in the county, so let our motto be "Service First," and then when our manager goes to the next managers' meeting he will be able to stand up before the general manager and say *"I Told You So."*

Correct and Incorrect Way of Making Tickets

By Lucile Darden, Louisville, Ky.

OPERATORS should be very careful in making out their tickets, for so much depends on their correctness. If the ticket is made out carefully and neatly it aids the chief operator in her duties.

A correct ticket should have full information so as to enable the chief operator to tell by a glance what step has been taken in passing the call.

For example, I have a ticket showing the trouble an incorrect ticket causes. On the second of this month Mr. Larmon called Mr. Bell at Louisville. The operator asked for the circuit at 8:40. Bowling Green gave her N. C. 8:55. Russellville party could not wait any longer. There being no other report on the ticket, the chief operator, in looking over them, could not tell whether the circuit was obtained. There was no delay on the switching sheet. The chief operator spent about an hour trying to ascertain the part of the ticket that was not explicit. She called B. G. and she also had no delay on her switching sheet, which caused extra trouble.

If the ticket had been made out correctly she could readily have seen the circuit was obtained at 8:55.

Operators' Schools in Ohio

W. S. VIVIAN, secretary of the Independent Telephone Association of America, has a busy six weeks before him conducting operators' schools in the various districts served by the Ohio State Telephone Company. His itinerary includes the cities of Columbus, June 29 and 30; Dayton, July 1 and 2; Toledo, July 6 and 7; Cleveland, July 8 and 9; Lima, July 13 and 14; Sandusky, July 15 and 16; Mansfield, July 20 and 21; Zanesville, July 22 and 23; Canton, July 27 and 28; Youngstown, July 29 and 30; Athens, August 3 and 4; and Portsmouth, August 5 and 6.

It will be noted that each school is given two days, and preparations are being made for interesting entertainments for the operators.

The Constantinople Telephone Company staff has been replaced by Hungarians, the control of the enterprise being at present in the hands of an Australian, Eugene Redl.

Phantom Line Balancing Problems

How Certain Specific Difficulties Were Overcome

BY OTTO H. JOHNSON

THE obtaining of a third circuit or "phantom" in connection with two existing physical circuits is well known to telephone men, and is extensively used by the long distance companies.

In order to operate a phantom circuit successfully for long distance purposes, the physical circuits must be kept absolutely balanced under all operating conditions. This is the prime requisite of efficiency.

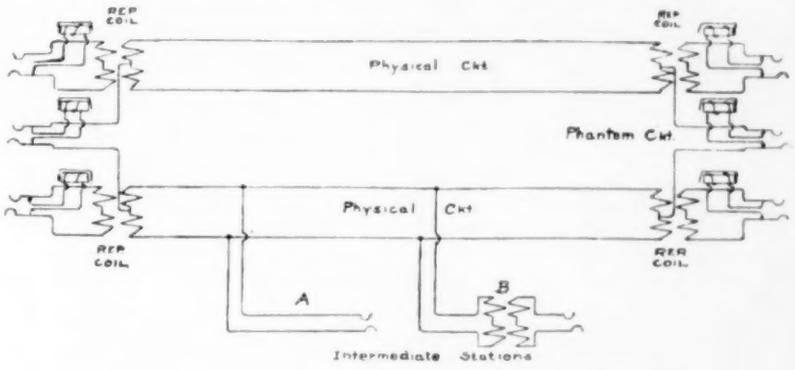


Fig. 1.

When the physical circuits of a phantom group are connected into intermediate exchanges, as shown at "A," Fig. 1, it is found in practice that under certain operating conditions the physical circuits are unbalanced momentarily, due to ringing on the line with a grounded ringing source or the connecting of an unbalanced line through a pair of cords to the physical circuit.

To overcome the trouble due to ringing, an ungrounded ringing source or an insulating transformer have been used. These remedies have, however, been found defective, due to the fact that in multiple position exchanges an operator may ring on a grounded line at the moment the toll operator rings on a physical circuit forming a part of a phantom group.

Another method employed is to connect an efficient repeating coil permanently across the line at each tap, as shown at "B," Fig. 1.

While this arrangement absolutely protects the phantom circuit both from grounded ringing sources and unbalanced lines, the physical circuits are rendered less efficient, due to losses in ringing and voice current transmission caused by the several repeating coils bridged across the line.

A method recently developed has been tried out and found to give satisfactory results in practice.

An ordinary jack is modified in such a manner as to procure two separate make contacts insulated from the tip and sleeve springs, as shown in Fig. 2. The primary winding of an efficient talk and ringthrough repeating coil is connected to the tip and sleeve springs and the secondary winding to the insulated springs, as shown. A high wound drop or signaling device (2,000 ohm) is bridged across the line.

In case of an operator transmitting or receiving a call the insertion of a plug in the jack causes the insulated springs to move out and make contact with the outer springs, thus automatically connecting the repeating coil into the circuit. The advantages of this scheme are that normally the circuits are free from any extra attachments and it is impossible to unbalance the physical circuits by

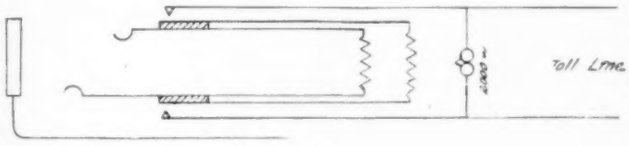


Fig. 2.

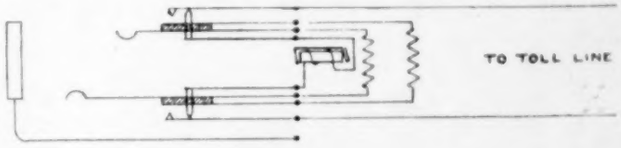


Fig. 3.

ringing or connecting lines which are not in proper condition for direct connection with the toll lines. Fig. 3 shows a jack arranged for disconnecting the drop when plug is inserted.

In central energy exchanges where the necessary current is available, the arrangement shown in Fig. 4 may be used to advantage. The secondary of the repeating coil is in this case connected to the open contact springs and the signaling device to the break contracts of a relay, the general principle being the same as in the special jack method.

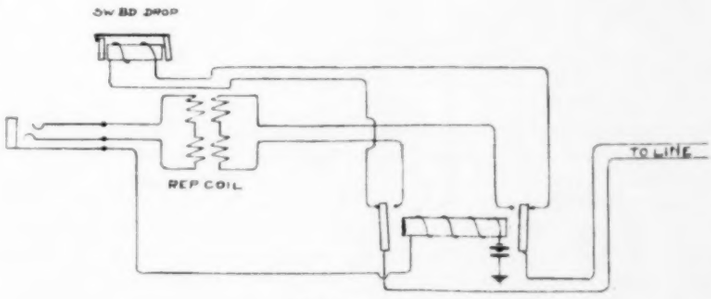


Fig. 4.

While these methods may not solve all the problems incident to the operation of phantom lines, it is felt that any addition to the available literature of the subject may be welcome to those who are interested in the perfection of this modern method of efficient transmission.

Efficiency Through Co-operation

Address Before the Tri-State Convention at Memphis

BY HON. WALTER G. JONES

UNDER the subject of efficiency through co-operation I shall discuss, first, co-operation between the company, or employer, and employe; second, co-operation between the company and the public; and third, co-operation between the various independent companies.

The last great war between crowned heads and enlightened and civilized nations for the control of capital, for the supremacy of the seas, and for the domination of international commerce is now being fought by our ancestors across the waters. The next great war will not be a war between nations, but it will be a war between capital and labor. However, this war will hardly come during our day and time, and probably it will never come if the people will wake up and take timely steps to avert it.

This feeling of unrest between the employer and the employe should be settled before the feeling of animosity has grown to the degree of the shedding of blood. Industrial war, like international war, will not settle any question of right and wrong. It would only prove which side for the time being was financially the stronger. In addition to the money cost of the struggle, the winning side would lose the good-will of the other side. Many remedies have been suggested and attempted to be exercised by which differences between the employer and employe might be adjusted. Arbitrators have been called in. The state and federal government have been appealed to. But a state is no greater than the people composing it; and the problem to be solved may be so broad as to embrace all the people of a state or nation without leaving an unbiased and unprejudiced arbiter.

SHOULD BE SETTLED BY EMPLOYER AND EMPLOYE.

Employers are keenly alive to the duty of their work people to do their best for them. Are they as keenly alive to their own duty to do their best for their work people? On the other hand, undoubtedly most workers have a sense of what their employers ought to be doing for them. Have they always as keen a sense of their own duty? Truly, our chief title to the doing by others of their duty to us is that we should be doing our duty to them. Some employers, of course, may be bad enough to defraud their nearest and dearest, but such are few. Some employers may be brutal and unjust. But brutality and injustice are not leading characteristics of employers' natures any more than of workmen. No class of men is hopelessly bad. All of us, employer and employed, are made of the same stuff, none of us too good and none of us all bad. Let the employer and employed approach each other, remembering that we are all fallible. In my humble judgment, this feeling of estrangement between the employer and employe can best be adjusted between the individual employer and his employes.

THE EMPLOYE AN ASSET TO THE BUSINESS.

I am glad to say that a much better and higher respect is now being entertained by the employer for the services of his employe that has heretofore been recognized. The employers are beginning to realize that the services of the employe are as much a part of the assets of the business enterprise in which he is employed as the capital invested therein by the employer; and that the success of a business depends largely upon the efficiency and loyalty of the man behind the wheel, or the girl before the spindles. But even with this new realization, there is none among the many experiments in human relations with which the business man is confronted so difficult as that of finding an equitable measurement for the value of the services each worker renders in an undertaking. There must be a method of compensation for services rendered adjusted to the possible quality and quantity of a man's output—something which will stimulate him and satisfy his sense of justice. I do not desire to be understood, of course, as saying that capital is not an essential factor in the success of any business enterprises, or that those who supply it should not be duly remunerated. But it is indeed difficult to see that the claims of the money lender are any greater than the claims of the workman. Both stand upon equal footing, each having supplied an element indispensable to the working of the scheme, but that element and material stuff is serviceable only when animated by the living spirit. To this spirit or intelligence, therefore, we conclude is equitably due the lion's share of the net profits, and in intelligence we include that portion of the labor employed which is directed to the organization, management, and supervision of the machines, human and mechanical. After this award, the remainder of the profits should be shared by the money lenders and the work people instead of going entirely to the former.

The great bulk of the population of the United States, both relatively and numerically, will one hundred years hence be descendants of those who are the wage earners today. They are our people and our nation; if not its backbone and skeleton, if not its brain, nevertheless its living flesh and blood. It is on these wage earners that the duty devolves of bringing up respectable girls and boys who are to be the future rulers of our homes and of our nation. There is not room for all these at the top, even if all were competent to climb, but it is the duty of every one to preserve their rights, wherever their sphere may be.

The conclusion may have already been drawn from what has been said, that my judgment is that profit sharing will assist in solving the labor problem; and that I am not alone in thinking so, is proved by the widespread interest which is being taken in the subject at the present time. In this, the workman is acknowledged as something more than a profit-earning machine. He is raised from the status of a wage receiver only, to that of a sharer in the profits and capital of the business. He is given an additional means of making provisions for contingencies and old age. He has imparted to him a new and larger outlook on life. His sense of responsibility, his thrift, independence and self-respect are developed. He has more pleasure in his work because of a personal interest in the result of it. The monotony of toil is relieved by his having something to look forward to at the end of the year.

Not only ought a young man apprenticed to a trade be made to feel confident that he has not been allowed to enter a race in which even before he started he was hopelessly outclassed, but he ought to see before him a reasonable certainty of tenure of position, of definite and increasing wages per hour until he has reached a maxi-

mum for his trade and locality; he ought to be assured of decent helpful companions; he ought to be certain that all those things essential to his health and safety which he cannot do himself are being done for him. Undoubtedly this would be more closely observed if they were permitted to work under the scheme discussed herein.

MAKES THEM MORE EFFICIENT.

To induce men to do the most efficient and effective work they can, you must give them fair treatment. Poor service is an evil in large part due to abuse of the employing power. There is no business in which the employes will or can work as well without the stimulus of self-interest as with it. No man will or can do as well for an employer whom he dislikes or hates as for one whom he likes or loves. The sense of ownership is a strong incentive to the workman to take a greater pride in the reputation of the company for good workmanship, and creates in him a determination to become more efficient and diligent in the discharge of the duties devolving upon him. It is a longing in the bosom of every human being to own, to have something he can call his own; and it is as natural as the instinct of the harmless and inoffensive dove to defend its nest, for this human being to preserve and protect this, his possession. If it is a business enterprise, he endeavors to see that it becomes the best business of its kind. This rule holds good whether he is the sole owner of the business or holds only an interest therein. Many of the most important business transactions of the world are consummated through the telephone as a medium of communication. You have a public duty to perform and it, therefore, devolves upon you to have the most efficient employes to discharge this duty. If this efficiency can the better be reached by the fact of your employes being co-owners of your company, then this is an additional reason why the scheme suggested should be adopted by you. Why hold on to that which if shared with your employes would not only make you both richer, but would raise your business to a plane which would be both a pride and pleasure to you?

It is not my purpose to discuss the various possible or prevalent forms of profit sharing. There are official and private reports on the subject which show what to avoid in these schemes and how to insure a reasonable degree of material and moral success. But suffice it to say that the base principle of a successful scheme for profit sharing should be, that every worker with over a year's service to his credit in the employment of the company by whom he is engaged should be given a direct share in the profits of the business, over and above his payment by wages. This share, or bonus, should be based on the amount of his annual salary, and should be paid out of the surplus profits remaining after the usual charges have been met, and a fair and reasonable fixed rate of interest has been paid on the ordinary actually paid-in share capital of the undertaking. Capital and labor should share equally in this further distribution of profits. The workers' share of the surplus profits should be paid over in cash, at stated periods of the year, and there should be a regulation that some portion of each payment should be invested in the business as by the purchase of shares. By this device, the employes will in a degree be brought into the enterprise, giving them an investment as permanent as the business.

CO-OPERATION BETWEEN THE COMPANY AND THE PUBLIC.

Telephone companies are quasi-public corporations, engaging in the public service. So, there are greater duties devolving upon your companies in certain respects which are not required of the ordinary private business enterprise. Being quasi-public corporations, there is a broad feeling of imagination entertained by the public generally as to just what a business of this nature is. They do not have the same kindly and friendly feeling for it that they have for a strictly private business, or one carried on by the government. They have a somewhat misconceived idea that it is a trespasser, doing some good to all, but showing partialities and favors to a few, and ultimately intending to deprive all of their just rights and dues. Their judgment in this respect has not altogether been ill advised, otherwise telephone companies and other quasi-public corporations would not today be under the supervision and control of state boards of commissioners.

This public feeling toward your companies is growing more intense, and unless some remedy is provided whereby the former may be made to believe that they are getting from you everything to which they are entitled, there will come to pass, as surely as the night follows the day, government ownership of all your lines. I think that your business can be so perfected as to furnish a more thorough, adequate and efficient service, and at a lower rate than could be done under government ownership; for this, and many other reasons I think it unwise for the government to assume ownership of your business. How this public feeling can be alleviated is the question. You must get closer to the people, make them believe that your business is their business, encourage those through whose territory your lines run to become stockholders and co-owners of your business.

There is not a home, however poor and humble it may be, but which has a road or path leading to its door, and there should be but few, if any, of these deprived of telephone service during this enlightened age. It is true that it requires capital to do this, but why not induce those so situated who desire your services to construct lines leading from your principle or main lines to their respective homes, as a consideration for which pay them in good valid stock in your company in addition to other inducements which may be given them? By this, they will necessarily be drawn closer to you, and will be more encouraged to assist in the efficiency and success of your business, and will be more inclined to bring about a better feeling with all those concerned with the services, management and operation of this or any other quasi-public corporation, and will induce other and similar business enterprises to follow your example.

CO-OPERATION BETWEEN THE VARIOUS INDEPENDENT COMPANIES.

And last, co-operation between the various independent telephone companies. You should not only be joined together in an association of which you are representatives, but you should be joined actually and physically together. None of you is so great in the extension of your lines that you may not become greater, and thereby be enabled to accommodate and meet the demands of more of the public. The demands of the public are not thoroughly and completely fulfilled by your business, until you are ready to furnish, on demand, service to any one at any place; therefore, to increase your business so as to be ready to furnish the service required of you, you must increase your patronage.

It is true that it is neither expedient nor wise for more than one of your companies to occupy any one territory, unless it be in a city. Therefore, the best thing you can do under the circumstances is to have an arrangement of some kind by which the lines in one territory may be joined to those of another and with another

until you are all joined together as one great system, and thereby be not only enabled to supply the entire public with all telephone facilities, but also to be able to compete with any of your large competitors.

Under an arrangement of this kind, you become recognized as being capable of handling more business over a larger territory, as a direct result of which, your patronage would be increased; the earning of each of your lines will have become so great as that it would not only be a money making business for your respective projectors and present holders, but it would be a flattering inducement for the public to become stockholders in your enterprises; and you would become a strong rival of some of your competitors. And as a rivalry between competitors bring about more efficiency in almost any public or private business, you would therefore become more thoroughly efficient in the discharge of your public duties.

Unquestionably there is no other enterprise which is in so much demand, and which has become so indispensable to the social, political and commercial world as the telephone. Every city, town, village and farm is supplied with telephonic conveniences. Lines extend into the remotest habitations of the prairie, into the mining camps on the mountain peaks, into the seclusion of the forests, and even upon and above the battlefields and beneath the waters of the warring nations, bringing their innumerable benefits to all. As time advances, improvements on electrical transmission of news are being rapidly made. We are approaching perfection in the art as the days pass. Truly, we are living in a land of progress and advancement, and as the world grows older, man becomes wiser. Inventions and improvements in the science of telephony of a few years back and which at the time seemed to be complete in construction in every particular have become developed beyond the greatest expectation of the inventor.

From the scientific toy of forty years ago, the telephone has developed into the world's greatest business factor, over which the most important business transactions may be consummated between contracting parties separated by the American continent as easily and as safely as if they were together in person. And the time is not far in the future when the world will be completely bound up in a pocket or network of wires, and suspended in space apparently thereby instead of being held there by the laws of gravitation. So, the development of the telephone service and facilities in the United States should be, and is, not only a matter of pride to you, but to the nation as well.

Telephone System for Hankow

Commercial Attaché Julean H. Arnold, Peking, China, writes: In a personal interview recently with Mr. Chow Wan Pang, Director of Posts and Telegraphs in the Ministry of Communications, I was informed, relative to the contemplated telephone system for the Wuhan cities [Wuchang, Hankow and Hanyang], that the specifications have been completed and that after their inspection by expert authority tenders will be called for in the Peking and Shanghai papers. It seems that arrangements will undoubtedly be perfected whereby the telephone systems for the various foreign concessions in Hankow will be taken over by the Chinese Telephone Administration, as also the German system now in use in Hankow city, and one general system substituted therefor.

Payment for the new system will be made in four equal installments—one-fourth to be paid down at the time of the acceptance of tender, one-fourth upon delivery of the materials, one-fourth upon the completion of the installation and its acceptance, and the final payment two or three years thereafter. Although it has not been definitely decided as to how many telephones the new system will provide for, 2,000 or 3,000 will probably be called for and arrangements made whereby the system will allow of an expansion up to 10,000 instruments.

Hankow is a very important center in China, and will probably occupy a position in this country analogous to that of Chicago in the United States. The combined population of the three Wuhan cities is comservatively estimated at 1,000,000. It appears that the main consideration in regard to this installation is the question of credit; hence it would be well for American firms to be prepared to make overtures in this direction in connection with any bid for the business.

Texas Asks State Control

A resolution requesting Governor Ferguson of Texas to submit to the legislature during the present called session the subject of state control of telephone and telegraph rates was unanimously adopted by the Texas Grain Dealers Association, which convened in Galveston. A copy of the resolution immediately was sent the governor by wire. Several members of the organization probably will go to Austin from Galveston and press their claims for submission of the matter which met defeat in the house committee during the regular session.

The resolution asking state control of telephone and telegraph rates set forth that cancellation of telephone coupon books in 1907 had the effect of increasing the rate 33 1-3 per cent; that cancellation of all night rates in 1914 resulted in an increase in some cases as high as 300 per cent, and that at the same time day rates were increased about 50 per cent, making a total average increase of about 100 per cent, and thus placing a heavy burden on nearly every line of business, and especially on dealers handling the farm products of this state. The resolution states that the business handled by the telephone and telegraph lines has now grown to such proportions as to make it essential to the welfare of the people of this state to exercise control of their rates and practices; therefore it is resolved, that the matter of state control of telephone and telegraph rates has now become such a momentous question that it deserves the immediate attention of the legislature.

Northwestern Indiana Association Formed

At a meeting held in Fort Wayne June 3, the Northwestern Indiana Telephone Association was organized by the Independent telephone companies operating in the northeastern part of Indiana and northwestern part of Ohio. Its object is to promote and to improve the telephone service within its territory. Forty companies were represented and the new association starts out with bright prospects for a successful and profitable career.

The officers elected are: President, Martin Umbach, Fort Wayne; vice-president, Lawrence Klopfenstein, Leo; secretary-treasurer, G. E. Spake, Monroeville; executive committee: W. E. Bowers, New Haven; J. W. Longwell, Van Wert, Ohio; F. M. Shirmeyer, Decatur, Indiana.

The Telephone Scrap Book

Curious and Useful Items, More or Less Telephonic, Gathered from Everywhere

Marconi's Wireless Telephone

FOLLOWING many rumors that a practicable wireless telephone was being quietly developed by Marconi, definite announcement has just been made that the Italian navy has adopted the instrument and the British admiralty has been conducting tests aboard English vessels. One instrument has already arrived in this country and communication has been established between New York and Philadelphia.

How great will be the distances spanned is not yet definitely stated, but it is reported that Marconi has expressed confidence in his ability to transmit audible speech across the Atlantic by multiplying the power and modifying the design of the present apparatus. It is possible that this feat may be accomplished when foreign conditions are again adjusted to normal. It would not be, as generally reported, wholly a scientific demonstration, for recent developments have given to transatlantic wireless telephony apparatus that would make it commercially practicable under ordinary business conditions. The short distance wireless telephone, however, will not wait for the end of the war. It is expected to become available for commercial use within a few months and will have a guaranteed range of at least thirty miles between ships at sea carrying aerials 100 feet high and with 200-foot span between masts, says J. Andrew White in the *Scientific American*.

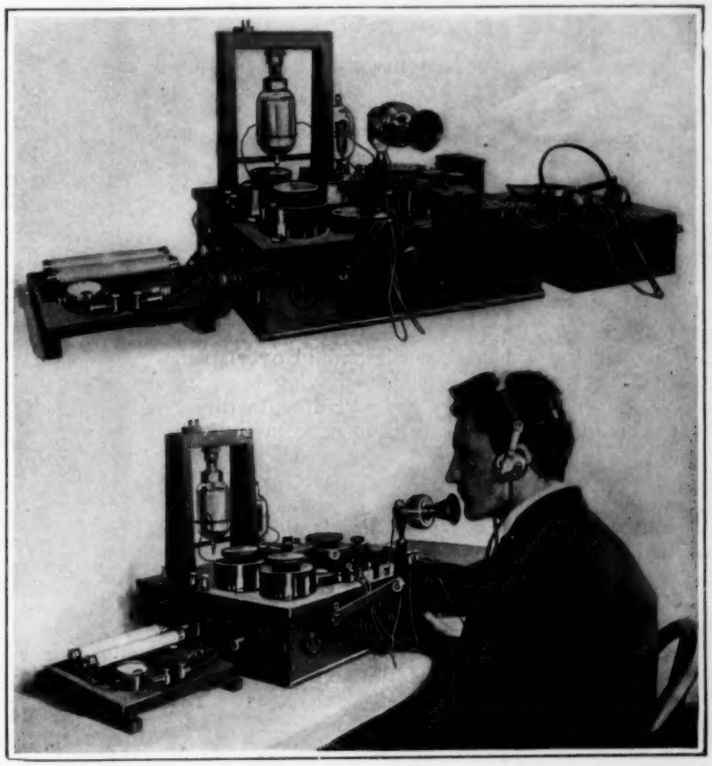
Unlike the wire telephone with its slight diaphragm distortions of the voice, the wireless instrument reproduces remarkably clear speech, and, if preferred, speech of equal quality but considerably stronger than that obtained with the wire telephone.

The wireless transmitter consists of a specially constructed valve which controls the current and is shunted with condensers and self-induction coils so as to produce a continuous stream of oscillations. The frequency of these oscillations is controlled through the variable ebonite condensers, shown in the illustration in front of the transmitting valve. The oscillations of wave energy produced by the valve being continuous, of high frequency and of constant amplitude, no sound is heard in the receiver, even if the latter is placed but a hundred yards away.

The variation required to transmit the tones of speech is secured by means of a microphone or sound magnifier, a method of connection with which permits this instrument and the receiving telephone to be placed in the captain's quarters or chart room while the apparatus itself remains in the wireless cabin. The change-over switch may also be controlled from a distance and with one operation it switches the instrument from talking to listening position.

An 80-ampere hour accumulator is provided for the low voltage current used to heat the filaments of the valves and four cases of dry cells connected in series give the tigh tension 500-volt current necessary for the vacuum of the transmitting valve. The usual value of the vacuum current being from 10 to 20 milliamperes it is sufficiently small to make practical the use of dry cells for intermittent purposes.

Through tuning, as in wireless telegraphy, it is possible to select the particular receiving station wanted, and adjusting to the series of waves emitted, exclude all other stations which happen to be sending within the range of influence at the same time.



The Marconi Wireless Telephone.

Some very remarkable predictions have been made as to the possibilities of this apparatus, which, however, have mostly been confined to the lay press.

Wiping a Lead-Covered Cable

IN making lead-covered-cable joints the following tools are generally used: A gasoline furnace and solder pot in which to melt the solder and an iron ladle to mix and pour it; a shaving hook such as shown in Fig. 1, to scrape or shave the surface of the lead where the joint is to be made; a mallet or hammer; and a pad to hold in the lower hand under the joint. This pad may be made of four or five thicknesses of ticking, about four inches square, one surface of the pad being rubbed with tallow, or with chalk and tallow, to prevent melted solder from sticking to it. A small hand glass or mirror is useful for examining the under side of the joint.

The following materials will also be required: Lead

pipe sleeves, wiping solder, paper pasters, and tallow candle. For wiping solder one large company specifies a 40-60 lead solder, and in place of mutton tallow, which is often used as a flux, stearic-acid candles. However, half-and-half solder is more generally specified. Another material required is gummed paper, frequently called paper pasters, 2½ inches wide, or plumbers' soil or plumbers' paste. A piece of chalk is also a convenience.

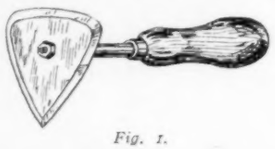


Fig. 1.

All these things—except, perhaps, the gummed paper—may be obtained from a plumbing supply house. The gummed paper comes in rolls and may be obtained at any printing shop.

Plumbers' soil is made by dissolving two tablespoonfuls of glue in one quart of boiling water or stale beer. Beat into the mixture one pound of lamp black and a tablespoonful of powdered chalk. Heat the soil each time it is used. Plumbers' paste is made by mixing flour and water quite thin, beating out all the lumps. By adding a little pulverized alum, the paste may be preserved a month or more. Thicken by heating it slowly over a fire.

In splicing, the lead sleeve should overlap the cable at least 1½ inches. The sleeve having been moved in place, the ends should be dressed down with a mallet, that is, hammered down so as to make a tight fit to the sheath.

Instead of plumbers' soil or paste, as used by most plumbers in a manner that will be explained, says H. E. Weightman in the *Electrical Review and Western Electrician,* most cable splicers now use paper pasters, first scraping with the shaving hook the portion where the joint is to be made and placing one strip of gummed paper around the sheath and another piece around the sleeve, leaving the lead exposed for a distance of about 1½ inches on each side of the joint, or a distance of about 3 inches between the adjacent edges of the paper pasters, as shown at the left end in Fig. 2. This brightened and exposed lead should be covered with candle grease or tallow to prevent it from oxidizing. Do this at one joint only, leaving the other joint until ready to wipe it.

Plumbers generally cover the joint for a distance of about 3 or 4 inches on each side of where the sleeve and sheath come together, first with chalk to counteract grease that may be present, then with plumbers' soil or plumbers' paste. After this is dry, make marks around the cable sheath and sleeve at a distance of 1½ to 2 inches on each side of the joint, using for this purpose the point of the shaving hook. With the shaving hook

Fig. 2.

shave or scrape the lead bright and clean for a distance of 1½ inches on each side of the joint, as indicated in Fig. 2, immediately covering the bright portion with tallow or candle grease.

It is very important to fix the joint firmly in some position so that the parts cannot move while the joint is being wiped. There should always be allowed a space of 4 inches around a joint in any case, so that the workman can do a good job.

Melt the necessary amount of solder, which will depend upon the size of the cable, in the pot and heat it to the proper temperature. The solder should not be any hotter than really necessary to make it flow. It should not be hot enough when in the pot to ignite a pine stick, when thrust into it, or just hot enough to char paper when thrust into it. When wiping a joint care must be taken not to have the solder too hot, or to pour too much of it at one place, otherwise there is danger of melting the lead sheath. Place a clean paper, board or pan under the joint to catch and keep clean whatever solder may fall on it.

Warm the wiping cloth until it becomes pliable, and hold it in the left hand, steadying it with the thumb. The cloth should form a hollow, resembling a saucer, so that it will receive and retain the solder that falls from the joint, in order to heat the under side of the joint. The solder should be thoroughly stirred with the ladle so as to mix the ingredients, tin and lead, together. The first object in making a joint is to tin the entire portion that has been scraped bright and covered with tallow, and the second object is to get on enough solder to make a tight and strong joint.

The solder is then slowly poured over the joint, the surplus solder being caught in the cloth under the joint, as shown in Fig. 3, taking care to heat the parts uniformly all around. When a quantity of solder has been

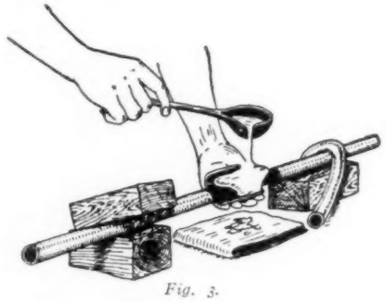


Fig. 3.

caught in the cloth, it should be worked around onto the top, then more solder poured on this, the surplus being caught in the cloth, as before, heating the under side of the joint with it and again working it to the top of the joint. When the solder on the joint has become so hot as to be plastic, and is inclined to slide or drop off, and if it is certain that the surfaces are thoroughly tinned, and that the sleeve and sheath are sufficiently hot to maintain the solder in a plastic condition long enough to perform the necessary work, and also that there is enough plastic solder to make a good joint, pouring should be stopped and the wiping begun. The colder pieces of solder that have set, or are beginning to set, are first thrown off the joint with the cloth, then the edges of the cleaned or shaved parts are located, and the solder is formed into the shape desired, as shown finished at the right end, Fig. 2, by hollowing the cloth for that purpose.

At the time of forming the joint, all the superfluous solder should be thrown off. The joint should then be finished by working the cloth around from bottom to top, on both sides, and finally drawing the cloth lightly across the top.

This movement frequently leaves some solder projecting over the paper pasters or soiling. This should be broken off as soon as it forms, by lifting it with a knife

blade. The hand glass may be used to see whether the under side of the joint is properly made. When the joint is made, it is well to spray a little water over it, or to fan it, in order to make it set rapidly, thus preventing the separation of the tin and lead in the solder, which may happen if it cools too slowly.

To wipe a joint on an upright cable, secure the parts

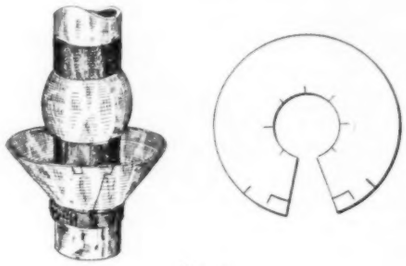


Fig. 4.

firmly in position, apply the plumbers' soil, paste, or gummed paper and shave the joint and put on tallow as previously explained. A collar should then be attached temporarily to the cable directly under the joint, so as to catch the solder and raise the temperature of that part of the sheath. In Fig. 4 is shown a piece of lead cable with a collar in position, the collar being supported by a cord tied around the cable. The collar should be cut to a pattern as shown, so that when it is formed around the sheath, the points can be doubled over and locked together, so as to prevent its falling apart when solder falls in it. These collars are best made of sheet lead, as this metal is very pliable and free from spring. The inner surface of the collar should be coated with soil or paste, each time it is used, to prevent solder from adhering to it. Paper collars are sometimes used, but for heavy cable work are not satisfactory. The heat may be applied to the joint by a gasoline torch. The solder is splashed on the joint from a ladle, using if necessary or convenient a flattened stick for this purpose. It is splashed on gently and in small quantities at first to avoid burning a hole in the sheath. The speed and quantity is increased, however, until a body of solder is piled up against the scraped portion of the joint. The splashing is continued, or metal may now be thrown on the joint from the ladle directly, until the joint is thoroughly and uniformly heated and the mass of solder is so soft that it cannot stay up, but slides down into the collar. As the sheath conducts the heat away, it is necessary to lift the plastic solder to the top of the joint, which cools first, in order to keep that part hot. When the solder persists in sliding down into the collar and when there is considerable more solder than necessary to finish the joint, the wiping cloth is used to wipe the solder into proper form.

When a wiped joint is to be made between a lead cable and a brass or iron sleeve or conduit, it is necessary to first tin the brass or iron sleeve thoroughly. To do this, the sleeve must be scraped clean and bright and resin or soldering fluid used as a flux to make the solder adhere to the brass or iron. The use of soldering fluid, such as zinc dissolved in hydrochloric acid, enables brass, and especially iron, to be more easily tinned, but the latter is very corrosive and must be thoroughly wiped off, both outside and inside the sleeve, before the cable is brought near it. With patience, either brass or iron can be tinned, using resin or some other non-corrosive soldering preparation as a flux, and by its use there is no danger of injuring the conductors or the insulation. A tight fit should be made between the lead sheath of the cable and the brass or iron sleeve; in most cases, the lead sheath can be inserted 0.25 inch or more inside the brass or iron pipe. The lead sheath is then prepared for a joint, which may be made in the usual manner.

If it can be avoided, a cable should never be opened during rainy or foggy weather. If a cable must be opened during wet weather, the cable ends should be thoroughly protected by means of canvas sheets. If caught in a shower while making a splice, great care must be taken to protect the cable ends from moisture by thoroughly soaking them in hot insulating compound and wrapping them in canvas.

In all cases where the end of a cable is left unconnected for a considerable time, the lead sheath should be sealed with a wiped joint and cap.

The sleeve is generally filled by pouring hot insulating compound through two holes cut in the lead sleeve for this purpose. These holes are made about one-third the distance from the ends and the hot insulation is formed into them alternately until the sleeve is filled. Sufficient time should be given the compound to permeate the cable and drive off any moisture that may be present. The expulsion of all moisture is important. Should there be any indication of moisture in the joint when the insulating compound is being formed into the sleeve, one end should be elevated, in order that, as the compound is being poured into one hole, it will run out at the other, carrying with it all the moisture. The amount of overflow should at least be equal to that required to fill the sleeve. This overflow should be caught and used again. When the joint is filled the holes are closed by carefully soldering sheet-lead caps over them.

Pipe Line Telegraphy

IT is sometimes possible to employ the gas and water pipes in lieu of a regular wire telegraph line in cases where the latter is impracticable. The circuit shown in

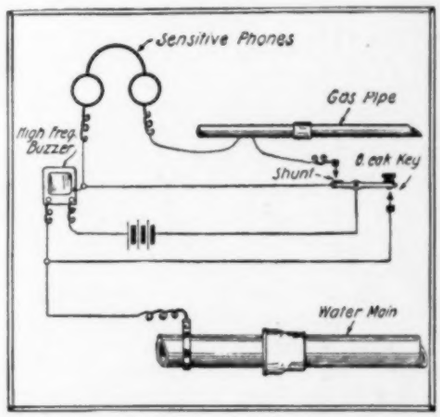
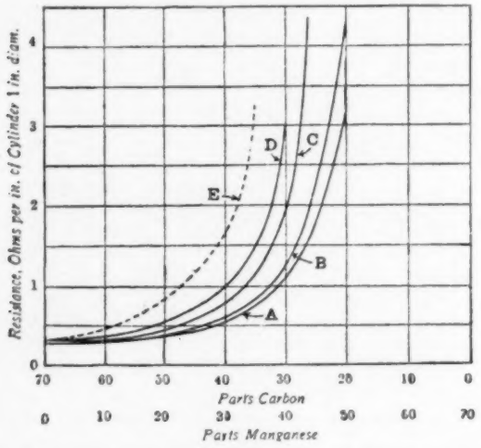


Diagram of Pipe Connections.

the accompanying illustration will usually work over a distance of a block or two. The diagram shows a "break in" system in use, but this is, of course, not essential to the operation of the sets. The usual circuit can be employed as well, the gas pipe being used as the overhead wire and the water pipe as the ground.—*Irving Farwell in the World's Advance.*

Data on Dry Cells

A NEARLY standard method of dry cell construction appears to prevail in America, said C. Hambuechen and O. E. Ruhoff in a paper read before the American Electrochemical Society. The anode is a cylinder of sheet zinc, which serves also as a container. The electrolyte is a solution of chloride and ammonium chloride held in a layer of absorbent material, usually paper, lying next the zinc, and separating it completely from the cathode. The cathode consists of a carbon pencil surrounded by a granular mixture of manganese dioxide, carbon and ammonium chloride. Graphite is also a common ingredient. This granular mixture is saturated with electrolyte containing ammonium chloride and zinc chloride in solution. The chemical inspection of dry cell materials should include a determination of the purity of these materials, especially as regards the presence or absence of quantities of useless inert substances, so as to indicate the percentage of the materials on which depend the usefulness of the cells. In addition to this, tests should also be made for comparatively small quantities of such impurities as exert an actively injurious effect upon the cell. The physical properties of some of the materials are of quite as great importance as are the



A=Coarse manganese and fine carbon. B=Coarse manganese and coarse carbon. C=Fine manganese and coarse carbon. D=C with 8.5 parts $ZnCl_2$ solution. E=D with 7.5 parts sal.

chemical ones. One of the most important of these is the conductivity of the crushed carbon and graphite, and that of the mixtures of these materials with manganese dioxide. The conductivities of crushed carbon and graphite depend upon the raw materials used in their manufacture, the conditions of heat treatment used and the size of the granules in the composition. Battery carbon may be prepared from petroleum, coke, retort carbon, or coke made from soft coal. The graphite which is used may be either a natural product or that manufactured by electric furnace methods. Crushed carbon and graphite may also be prepared from used furnace electrodes, or from worn-out electrodes from electrolytic processes.

For the determination of the conductivities of crushed materials and mixtures an apparatus especially devised for the purpose was used. The material to be tested is placed in a porcelain tube 2 inches long and 1 inch inside diameter. The bottom of the tube is closed during the test by a removable graphite plug, and the tube is filled flush with the material to be tested. The tube is placed in an upright position and another graphite plug inserted at the top upon which a pressure of 15 pounds is exerted by means of a suitably arranged lever and weight. A current of 1 ampere is passed, the graphite plugs serving to make connection to the column of granular material. The circuit includes an ammeter and a variable external resistance. The drop in voltage between the graphite plugs is measured by voltmeter. The same testing apparatus is also arranged to test the conductivity and breaking strength of carbon pencils. A number of samples of crushed graphite and carbon as supplied by various manufacturers and made by various processes have been tested for conductivity. For graphite there have been obtained readings varying between 0.071 and 0.411 ohm and for carbon between 0.188 and 0.637 ohm perlinear inch of a column 1 inch in diameter, equalling resistances of 0.14 to 0.82 ohm for graphite and 0.37 to 1.27 ohm for carbon, per cubic centimetre. The minimum readings in each case represent a very high grade of material, while the maximum ones indicate materials which are practically useless for most battery purposes. Most of the samples of carbon tested have been crushed so as to pass through about a 20-mesh screen while the samples of graphite will usually pass through a 100-mesh screen. In comparison with carbon and graphite, the other insoluble ingredient of pulverized dry-battery filler—manganese dioxide—has a very low conductivity, so that as far as the final conductivity of the whole mixture is concerned, the manganese dioxide may be considered as practically a non-conductor. It follows, therefore, that the higher the proportion of MnO_2 in the depolarizing mixture, as compared with the conducting ingredients, the higher will be its resistance, presuming, of course, that the size of granules in the composition and the equality of materials remains the same. The curves plotted on the accompanying chart indicate in a general way how the conductivities change with variations in the proportions of conductive to non-conductive materials, and with variations of the size of granules in the composition for the same proportions by weight. Variations in the conductivity of 10 to several hundred per cent can be brought about by varying the size of granules in the composition of a mixture, with no change in the proportion by weight of the several ingredients.

Four of the typical brands of cells investigated and concerning which data are given in the tables are designated by the letters *A*, *B*, *C* and *D*. It will be noted from the tables that there is comparatively little variation in the composition of these several makes of batteries. Perhaps one reason for this is the strong demand of the American market for a low-priced cell, compliance with which places narrow limits on the manufacturer in indulging any desire he may have to improve the quality of the battery by using more expensive materials, or by devising a more complicated structure.

Table I shows the weights, dimensions and physical properties of several types of batteries. The size of granules in the composition and the percentage MnO_2 on the several sizes of the washed and dried mixtures is shown in Tables II and III. In general, it seems that an increase of MnO_2 in the coarser sizes will reduce the internal resistance of the battery. On the other hand, there are indications that an increase in the proportion of very finely divided manganese dioxide results in greater depolarizing power per unit weight of the MnO_2.

TABLE I.

	A.	B.	C.	D.
Voltage of cell	1.50	1.57	1.55	1.50
Amperes on short-circuit (flash test)	33	33	32	30
Weight of cell, grammes	980	932	984	942
Weight of moist depolarizing mixture, grms.	642	545	576	574
Weight of paper lining, wet, grammes	61	71	65	72
Diameter of carbon pencil, inches	1	1	1	0.75
Weight of zinc, grammes	117	110	132	151
Resistance, in ohms, of depolarizing mixture per linear inch of a 1-in. column	0.94	1.69	1.90	0.86
Resistance, in ohms, of depolarizing mixture per cubic centimetre (resistivity)	1.84	3.21	3.72	1.69
Relative coherence of depolarizing mixture.	1.9	1.7	1.5	1.6

TABLE II.

Screen Analysis of Washed and Dried Depolarizing Mixtures.

	A.	B.	C.	D.
On 20 mesh (8 openings per cm.), per c.	4.8	0.2	1.3	0.5
On 40 mesh (16 openings per cm.), per c.	25.5	12.8	20.0	29.0
On 60 mesh (24 openings per cm.), per c.	11.8	14.3	10.5	12.0
On 80 mesh (32 openings per cm.), per c.	4.3	5.3	7.0	3.3
On 100 mesh (40 openings per cm.), per c.	9.8	22.5	28.8	12.0
On 150 mesh (60 openings per cm.), per c.	2.3	7.3	8.5	4.5
Through 150 mesh (60 openings per cm.), per c.	41.5	37.6	24.2	38.7

TABLE III.

Percentage of MnO_2 in Various Sizes.

	A.	B.	C.	D.
On 20 and 40 mesh	74.9	71.5	82.5	60.3
On 60 and 80 mesh	53.8	61.6	46.3	45.9
On 100 mesh	45.2	38.3	27.1	41.8
On 150 mesh	44.4	37.0	30.8	38.1
Through 150 mesh	31.3	38.3	50.2	31.7

TABLE IV.

NH_4Cl and $ZnCl_2$ in Papers and Mixtures.

	A.	B.	C.	D.
Grammes NH_4Cl in papers, per cell	10.1	13.4	12.3	12.3
Grammes NH_4Cl in mixture, per cell	36.2	42.6	25.1	30.5
Grammes NH_4Cl, total, per cell	46.3	56.0	37.4	42.8
Grammes $ZnCl_2$ in papers, per cell	7.0	6.8	9.7	8.9
Grammes $ZnCl_2$ in mixtures, per cell	13.8	10.3	15.8	15.5
Grammes $ZnCl_2$, total, per cell	20.8	17.1	25.5	24.4

Table IV shows the quantities of zinc chloride and ammonium chloride present in the solution held in the paper and in the solution with which the depolarizing mixture is moistened. The quantity of water present in a No. 6 dry cell varies somewhat for different makes. The lower and upper limits are about 60 and 90 grammes. Other things being equal, a better cell probably results from approaching the latter figure rather than from too close an approach of the former. Measurements of the conductivity of the mixtures were made directly upon the depolarizing material as removed from the batteries, but previous to making the test all of the mixtures were passed through a 10-mesh screen. The internal resistance of the battery depends, naturally, not only on the conductivity of the mixture, but also the tightness with which it has been compressed in filling the cell. Additional factors influencing the internal resistance that will result from any given mixture are the weight per unit volume of battery space and also the manner in which the packing is performed.

The remaining common ingredient of dry cells is the least costly of all, but it is nevertheless of considerable importance. This is the air occupying the "void" spaces in the depolarizing mixture—that is, space not occupied by water, salts, carbon, graphite or manganese dioxide. The volume of voids varies from about 3 cubic cm. to 15 cubic cm. All the data given have reference to a standard "No. 6" cell, the dimensions of which are 2½ by 6 ins.

The Efficiency of the Subscriber

AFTER the efficiency of the operator, the point next in order of importance in regard to which progress should be very carefully studied and continuously reviewed by exchange officers is the efficiency of the subscriber, according to a paper read by P. W. H. Maycock before the English Post Office Telephone and Telegraph Society. The joint is of such importance that it should be clearly stated in any discussion of the subject of the efficiency of the service, despite the risk of wearying some readers with matter which to them will seem very elementary.

It is a matter of common knowledge to all connected with telephone work that a successful telephone call can only be produced by the co-ordinated action of subscriber and exchange. But comparatively few realize to what extent the *degree of efficiency* attained in the operation of a particular call is affected by the *degree of co-operation* existing between the parties concerned; and still less the extent to which efficiency of service as a whole depends upon the subscriber's standard of working. Broadly, the situation is that every time a subscriber works slowly or incorrectly the A operator must take a longer time to deal with his call; and every instance in which an abnormal time is so taken means either delay or less efficient attention to other calls claiming the operator's attention. This reduced efficiency produces dissatisfaction on the part of the subscribers concerned, and causes friction between them and the operator—who is usually quite helpless in the matter—and still further reduces her speed. Thus the efficiency of her working with other exchanges is affected, and therefore the efficiency of B operators at those exchanges, causing a still further

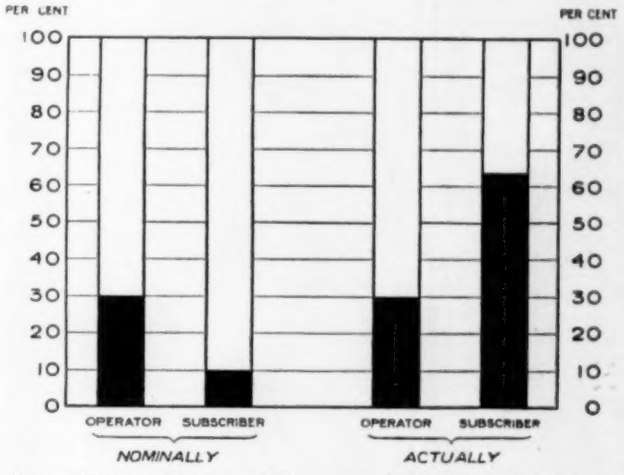


Fig. 1.—Relative Efficiency of Operator and Subscriber. Black Equals Percentage of Irregularities on Calls.

reaction against the A operator. It is very difficult to make clear from mere description the cumulative effect of lack of co-operation between operator and subscriber, but in actual fact the subscriber's working is everywhere so closely woven into the fabric of mutual effort which is called "telephone service" that the effects of a bad instance of lack of co-operation will spread far beyond the place of its occurrence, just as surely as the waves made when a stone is thrown into a pool of water. A careless operator, it is true, can nullify the best efforts of the subscriber; but it is no less true, though, far less realized, that the ignorant or careless subscriber can nullify the best efforts of the operator; and there are something like one hundred times as many subscribers as there are operators.

But it may be pointed out that accepted statistics show that, as measured by operating irregularities, the operator is far worse than the subscriber; and that, therefore, it will be time to criticise the efficiency of the subscriber when the exchange has set its own house in order. This is too serious an objection to pass in silence; the challenge of the accepted figures is insistent, and must

be met. Briefly, the situation is this: taking the latest accepted figures covering an extended period, the percentage of irregularities on the part of operator and *subscriber* is as 30.1 is to 11.3. That is to say, as measured by percentage of irregularities, the operator is nearly three times as bad as the subscriber. But is this so? After a few weeks' work in an exchange a shadow of suspicion as to the relative whiteness of the subscriber's record begins to pass over the mind of the observer, gradually darkening with increasing experience until he almost doubts. Should the bold skeptic push his inquiries to the length of systematic criticism and analysis he will find something like what is shown in diagram No. 1.

This diagram shows graphically the relative efficiency of operator and subscriber: (*a*)as it is usually represented, and (*b*) as it really is. The shorter of the shaded blocks in each case represents the more efficient record. Looking first at the "nominal position," the only

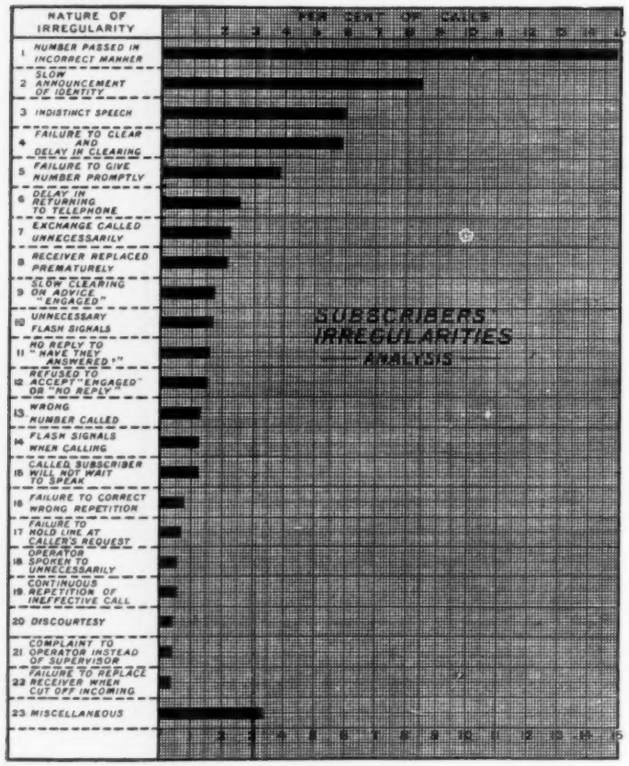

NATURE OF IRREGULARITY
PER CENT OF CALLS
1 NUMBER PASSED IN INCORRECT MANNER
2 SLOW ANNOUNCEMENT OF IDENTITY
3 INDISTINCT SPEECH
4 FAILURE TO CLEAR AND DELAY IN CLEARING
5 FAILURE TO GIVE NUMBER PROMPTLY
6 DELAY IN RETURNING TO TELEPHONE
7 EXCHANGE CALLED UNNECESSARILY
8 RECEIVER REPLACED PREMATURELY
9 SLOW CLEARING ON ADVICE "ENGAGED"
10 UNNECESSARY FLASH SIGNALS
11 NO REPLY TO "HAVE THEY ANSWERED?"
12 REFUSED TO ACCEPT "ENGAGED" OR "NO REPLY"
13 WRONG NUMBER CALLED
14 FLASH SIGNALS WHEN CALLING
15 CALLED SUBSCRIBER WILL NOT WAIT TO SPEAK
16 FAILURE TO CORRECT WRONG REPETITION
17 FAILURE TO HOLD LINE AT CALLER'S REQUEST
18 OPERATOR SPOKEN TO UNNECESSARILY
19 CONTINUOUS REPETITION OF INEFFECTIVE CALL
20 DISCOURTESY
21 COMPLAINT TO OPERATOR INSTEAD OF SUPERVISOR
22 FAILURE TO REPLACE RECEIVER WHEN CUT OFF INCOMING
23 MISCELLANEOUS
SUBSCRIBERS' IRREGULARITIES
ANALYSIS

Fig. 2.

conclusion possible is that as compared with the operator from the point of view of efficiency the subscriber is practically perfect; the diagram representing the "actual" position suggests a rather different conclusion. Nominally, the operator is three times as bad as the subscriber; actually, the subscriber is twice as bad as the operator and six times as bad as usually represented.

The diagram just shown is based on observations taken recently at four exchanges, City, Central, Mayfair, and Gerrard; observations in which the observing officers were specially instructed to apply to the subscribers working the same standard of severity as that appropriate to an operator. Despite the fact that in the case of one exchange at least it was found impossible to prevent the observing officer following unconsciously the usual practice of taking a more lenient standard when criticising the subscriber, the percentage of subscribers' irregularities was 63.6 instead of 11.3. Instead, therefore, of the operator's record being nearly three times as bad as that of the subscriber, the subscriber's record is more than twice as bad as that of the operator, as already stated.

A great deal has been heard of the frequency of "wrong numbers." In this connection it is of interest—and possibly some significance—to note that more than 20 per cent of the 63 per cent subscribers' irregularities are faults which either will result or may result in wrong numbers—without any fault on the part of the exchange. In 14.9 per cent of the number of calls the subscriber passes the number in an incorrect manner; in 6 per cent he speaks indistinctly, and in 1.29 per cent he actually asks for the wrong number.

Every thoughtful person who has studied complaints must have envied the high business efficiency which alone would justify the attitude so often assumed by the complainant. Here are some examples of that efficiency as applied to telephone practice:

In 8.46 per cent of the calls the called subscriber fails to announce his identity promptly.

In 5.86 per cent the subscriber fails to clear or delays clearing.

In 3.81 per cent he fails to give the number promptly.

In 2.51 per cent the called subscriber fails to return to the telephone before the caller becomes impatient.

In 2.23 per cent he calls the exchange unnecessarily.

In 1.59 per cent he fails to reply to the operator's question "Have they answered?"

In 1.22 per cent the called subscriber fails to wait at the telephone until the calling subscriber or operator speaks.

Whether these figures betoken efficiency can be left to the judgment of the reader, but each of the items mentioned has a distinctly adverse effect on the efficiency of the exchange. Conversely, every improvement in the subscriber's working in these respects necessarily improves the efficiency of the exchange. The foregoing is sufficient introduction to diagram No. 2.

Buffalo Violates Federal Franchise

The Federal Telephone Company will not have to pay the city of Buffalo three per cent of its gross receipts for the years 1909, 1910 and 1911, and will not have to furnish the city with free telephones, as provided for in the franchise granted to the company on September 20, 1901. This is according to a decision handed down by the supreme court in the Federal Telephone Company's case, which involved the right of the city to the free telephones and the per cent of the earnings under the franchise.

The decision holds that the city violated the franchise agreement in October, 1909, when it permitted the New York Telephone Company to begin operations in Buffalo without exacting from it conditions for percentage payments and for free telephones, and opened the way for the Federal to get out of its part of the obligations imposed by the franchise agreement.

The franchise agreement in question provided that the Federal Company pay three per cent of its gross and five certain free telephones for franchise rights upon condition that the city of Buffalo shall not grant to any other telephone company lawfully doing business in Buffalo terms of conditions more favorable to such company than are granted to the Frontier Telephone Company, whose franchise the Federal acquired.

Telephone Talks

The July, 1915 Installment of an Instructive Serial Course for all Telephone Workers

BY G. W. CUMMINGS AND ARTHUR KNEISEL*

AS SOON as the President announced the discussion hour of the meeting the Secretary read a communication criticizing the record of the previous meeting. Fig. 59 shows parties *2, 3* and *4,* all reversed at the multiple jack. The drawing and description would be consistent if the tip and ring of station *3* were connected straight similarly to station *1.*

Upon recognition by the President, the Switchboard-man said, "The description given by the Jumper-man was correct for a hypothetical case, particularly if the circuit in Fig. 59 is changed according to the communication, then the two are consistent, but I have just received a new blue print of the B board circuit which shows several minor changes. As the description of the B circuit is necessary in the story of how we ring our party lines, I think that we should redraw Fig. 59 and show the conditions as they actually exist in the later built offices at the present time rather than as shown, although that did show an operative circuit."

"I wish to take exception to the statement made last meeting relative to the connection of two-party lines at the i. d. b.," said the wire chief. "At the present time we connect the multiple clips of each party at the panel and jack block by 3 way jumpers and connect the two way jumpers from the arrester block of the i. d. b. to the under end of the multiple clips of the first party."

"What do you mean by the first party of a two-party line?" asked the Cable Splicer's Helper.

"It is the party whose multiple is connected tip to tip and ring to ring. The second party is the one whose three conductor jumper is reversed (tip and ring) at the intermediate multiple block."

"This discussion is gratifying," said the President. "It shows that some of our members are checking the record and we may feel assured that our efforts are bearing fruit. For my part I am glad that the Jumper-man made the error in Fig. 59 for it has brought out several new points and an interesting question. I hope that you will continue the good work of checking the record.

"Since the Switchboard-man has new information relative to the B board circuit, I think we had better let him redraw Fig. 59 and show how the new offices connect their four party lines. He can then take up the story of the B circuit and tell us the part it plays in four-party selection."

The Switchboard-man rapidly drew the line circuit explaining as he drew.

"In this sketch I will also add the resistances which are bridged around the condenser at the subscriber's station (Fig. 64) and I will use the 163E relay, in which a thousand ohm line relay having two windings is used. You will note in this sketch that stations *1* and *2* have their tip and ring reversed at the multiple jack. Stations *1* and *3* have the 130 ohm coil in the sleeve wire.

"There is so much to be said relative to the line circuit, the cord circuit, and the trunk circuit and their method of operation, that I doubt whether we will touch on the ringing circuit at all tonight.

"While simple in principle, consideration of the subscriber's line circuit is complicated by the variety of conditions which must be met. In the older exchanges, which were not designed for nickel first service, such as shown in Fig. 59 used during the last discussion, we may trace the path of the line battery through the 60 ohm line relay, through a back contact of the 30 ohm cut-off relay to the ring side of the line. By taking his receiver off the hook the subscriber closes the circuit, allowing the current to flow through his transmitter and the primary winding of the induction coil to the tip side, and through the other back contact of the cut-off relay to ground. This current operates the line relay, whose frame is grounded on the frame of the relay bay, and which lights the line lamp through a front contact. The line lamp battery is supplied through a pilot relay—47 ohm No. 118 U in the latter installations which controls a pilot lamp in each position. The pilot lamp ground is made through a night alarm relay, which is short circuited during the day, but rings a bell at night.

"In the offices which have been built since it was decided to adopt the nickel first system, the tip and ring wires are reversed at the cut-off relay, so that we send out battery through the line relay on the tip and ground on the ring. The idea in this was that to adapt the circuit to nickel first the only change needed in the office would be to take the ring wire off the cut-off relay, sending out battery on the tip with the ring open. In the older offices it was necessary to open the ring and substitute the tip wire for the ring. Since a 60-ohm line relay is not altogether satisfactory for nickel first service in outlying exchanges, we will also change the No. 163-M line and cut-off relay to the No. 163-E, using a 1,000 ohm line relay. However, we will not go into the nickel service circuits tonight.

"In practice, the line and cut-off relays are mounted in banks of ten in the relay bay (shown in the background of Fig. 60, previous meeting), with common battery leads which are fused on the fuse panel. The iron work of the bay is carefully grounded, and the necessary ground connections to the relays are made on the frame. A four-way cable takes the tip, ring, sleeve, and lamp wires to the answering jack block on the intermediate frame, where they meet a similar cable from the answering jacks in the A board. In signaling the operator we draw battery through the pilot relay and line lamp in the A board, down to the fourth clip on the answering jack block, thence over the contact of the line relay.

"It might be an interesting test of the strength of our practical imagination to see how clearly we can picture to ourselves the path of this current, and the value of that ability in locating trouble on a circuit which extends as considerable a distance as this is obvious.

Switchboard cables run to the answering jacks and are connected permanently to the panel and jack blocks. The answering jacks are arranged in panels, the number per panel depending on the volume of traffic. The number of panels per section depends entirely on the type of board.

"The panel and jack number bears, of course, no

*Copyright, 1915, G. W. Cummings and Arthur Kneisel. Book rights reserved.

relation to the line number; and it is important that the number plates be kept in good condition and correct.

"In some cases we have, at the request of the Traffic Department, provided certain lines with overflow jacks by bridging the tip, ring, sleeve and lamp of an additional answering jack to the corresponding clips of the primary answering jack by means of jumpers in the intermediate frame; cutting off the relays wired to the overflow jack. The purpose of this arrangement is to admit of a call being answered in either position. An elaboration of this scheme is found, where we have followed present standard A. T. & T. practice in multipleing all the answering jacks in the adjoining section. These multiple jacks are called ancillary answering jacks.

"Color Code.—To assist in tracing our circuits and locating trouble we use a rather elaborate color code throughout. The following list, taken from Engineering Department Specification No. 567, shows the proper colors to be used for jumpers, arranged in tip, ring and sleeve order.

MAIN DISTRIBUTING FRAME.

Calling Circuits, Though and Terminating	Blue-White & Red-White
Charging leads	Green
Common Return Ground	Blue
Desk Wires	White and Red White, Blue and Red
Miscellaneous	Brown White and Red White, Blue and Red
Subscribers' Lines, Terminating	White and Red
Subscribers' Line, Fire Alarm, Terminating	Red and Red-White with overall braid of Red
Subscribers' Line, Grounded	Red
Subscribers' Line, Through	White and Brown
Through Lines, Miscellaneous	White and Brown
Toll Lines, Through	White and Brown
Toll Lines, Terminating	White and Blue
Trunk Lines, Through and Terminating	White and Blue
Watch Service	Red-White

INTERMEDIATE DISTRIBUTING FRAME.

Desk Wires	White and Red White, Blue and Red
Miscellaneous	Brown White and Red White, Blue and Red
Subscribers' Lines	White, Blue and Red
Subscribers' Lines, Fire Alarm	Red-White, Red-Green and Red, with overall braid of Red.
Subscribers' Lines, where relays are connected other than standard.	White, Blue and Red with overall braid of Green
Tone and Busy Test Leads	Green
Service Meters	Orange

In factory cable the pairs are arranged as follows:

Pair No. 1	Blue
" 2	Orange
" 3	Green
" 4	Brown
" 5	Slate
" 6	Blue-White
" 7	Blue-Orange
" 8	Blue-Green
" 9	Blue-Brown
" 10	Blue-Slate
" 11	Orange-White
" 12	Orange-Green
" 13	Orange-Brown
" 14	Orange-Slate
" 15	Green-White
" 16	Green-Brown
" 17	Green-Slate
" 18	Brown-White
" 19	Brown-Slate
" 20	Slate-White

The first twenty pair are paired with a white wire and the second twenty with a red. The master (white or red) is always the tip wire and its mate the ring. In triple conductor cables, such as those from the multiple jacks to the intermediate frame, the third wire is the same color as the ring with the addition of red. In the case of power wiring, whether silk and cotton or braided rubber covered, the master or solid color is always ground and its mate battery or generator.

"I presume that the term A board originated from the fact that this was the original switchboard, the B board being installed only as it became necessary to divide an exchange system into districts. Where one board is sufficient to serve an exchange system, we use a standard A board with full multiple. As a system grows and the number of offices in it increases the percentage of originating calls which are completed locally becomes

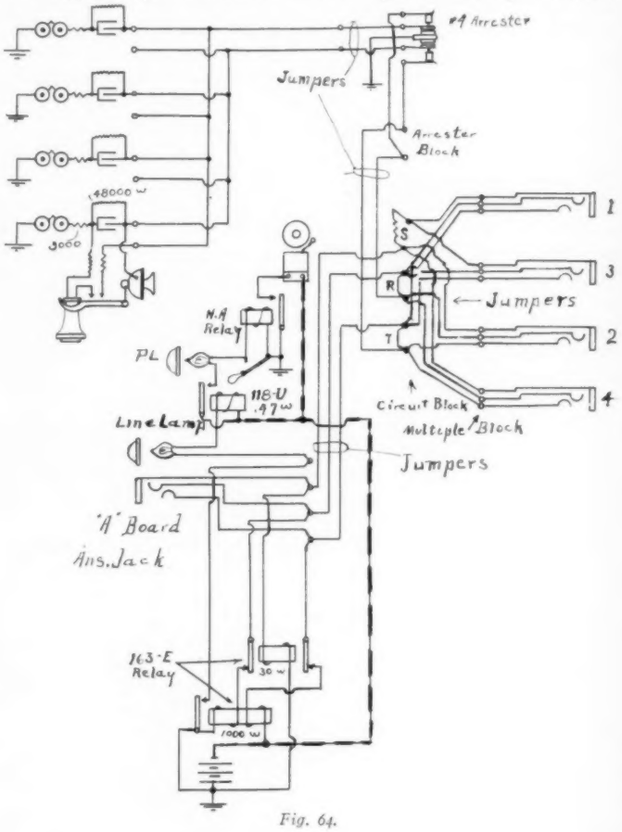


Fig. 64.

gradually less; until, as under present conditions in large cities, it is no longer worth while to maintain an A multiple. This brings us to our present arrangement, where the A board is used merely for answering the calls from the subscribers in each exchange, and the B board for completing all connections to them, wherever these connections may originate.

"To properly operate in connection with the subscribers' line circuit which we have outlined, we require a cord circuit which must cut off the line battery and ground by operating the cut-off relay, must furnish talking battery to the subscriber, indicating—by means of this battery—whether his receiver is on or off the hook, must enable an operator to "listen in," and give her a busy test when putting up a connection, must provide means for transmitting the speech fluctuations from the answering to the connecting cord—and vice versa—and must be

provided with auxiliary apparatus for operating coin collectors or message register. In addition to this, where A board multiple is used, the operator must be able to ring on the connecting cord. In such a case, a ringing key is connected in the connecting or calling cord to open the circuit towards the called party. I will sketch such a circuit (Fig. 65) which by the way is not the cord circuit we use at the present, but shows sufficient to take on discussion through to the trunk circuit. I have omitted the nickel service and message register keys. They will furnish material for an evening's discussion later on.

"A very important part in the cord circuit is played by the repeating coil. There are four windings on the repeating coil arranged in inductive pairs, the inside ends of one pair going to the negative or line side of the office battery and of the other pair to the positive or grounded side, while the outside ends of the first pair go through the supervisory relays to the rings of the answering and connecting cords and the outside ends of the second pair go to the tips of the cords. There are three objects which are attained by the use of this coil. First, furnishing talking battery to the cords through a safe resistance—each winding of the No. 25-A coil measures twenty-one ohms; second, furnishing a means of transmitting speech fluctuations from one cord to the other, by means of induction from one side of the coil to the other; and third, retarding or choking back cross talk and battery noises and keeping them off the subscribers' connection. Speech is transmitted through the repeating coil by induction only for there is no electrical contact between its windings except that they tie to the same exchange battery.

"The path of the talking battery on the connecting cord is through one winding of the repeating coil, through the supervisory relay, which is pulled up by the current through it when the receiver is off the hook, to the ring of the plug, the ring of the jack, over the line and through the instrument back to the tip of the jack, the tip of the plug and through another winding of the repeating coil to ground. In the old cord circuit a No. 104-A key was looped into the connecting cord, with generator and ground on the outside contracts now used for nickel work. Where A board multiple is still used the generator and ground have been left on the No. 104 key as shown at *G. N.* (Fig. 65) No. 293 nickel key looped into the answering cord. Where generator is needed only occasionally, as in offices having ring-down trunks to the chief operator or to other desks, the older arangement has been left on the last one or two pairs of cords, while the others have been changed as just described; that is, an operator has both kinds of cords. The path through the answering cord is similar except that the key is omitted.

"The cord circuit we now use is much more complicated due to the nickel and message register circuits, but the essential features are identical to those shown in the sketch. I have omitted the detail of the operator's circuit for an explanation of its operation would be lengthy and would not be of particular value at this time. The operator's circuit is connected to *O. C.* (Fig. 65.)

"To prevent transmission losses due to self-induction or retardation, it is necessary to provide a non-inductive shunt around the relay windings, where the relays are included in the talking circuit. The supervisory relay in the cord circuit is the most common and typical case of this kind, as we require an inductive winding to operate the relay when current is drawn through it by the subscriber and a non-inductive winding shunted around it to provide a path through which the fluctuations set up by the subscriber's transmitter may pass without distortion.

"The sleeve in this circuit serves three distinct purposes; that of furnishing current to pull up the cut-off relay, which cuts off the line battery and ground when the operator plugs in; that of putting busy test on a line when in use; and that of providing a local circuit for the supervisory lamp. In the subscriber's line circuit, you will remember that we send out battery and ground through the back contacts of the cut-off relay, and that one side of the winding of the cut-off relay goes to ground, the other side to the sleeve of the jack. If we insert a plug having battery on the sleeve, we will pull up this relay, cutting off the line battery and ground and leaving a clear circuit from the cord to the instrument. Before completing a connection the operator taps the sleeve of the jack called for with the tip of her plug, which is grounded through the repeating coil. As there is normally only ground on the sleeve, she will get no result and will complete the connection. If, however, there is already a connection upon the line, she will draw battery from the sleeve of the plug in the jack through the tip of her own plug to ground, getting the busy click.

"The battery on the sleeve is drawn through a 12-volt No. 2 supervisory lamp and an 83-ohm resistance in series. Between this resistance and the lamp is tapped off a 40-ohm resistance going to the frame of the supervisory relay, the front contact of the relay going to battery. This is the present standard, although a considerable number of A positions are still working on an older circuit where the relative positions of the lamp and 83-ohm, resistance are reversed, the resistance going to battery and the lamp to the sleeve. The principle of this circuit is simply that of lighting the lamp when the cord is up, but little or no battery flowing over the talking circuit, and extinguishing it by closing the 40-ohm shunt around it when the supervisory relay pulls up. We shunt the lamp out instead of opening it for several reasons, the principal being the necessity of keeping battery on the sleeve at all times to hold up the cut-off relay and to put a busy test on the line.

"The flashing service of this arrangement is much quicker and more reliable than where the lamp circuit is opened by the supervisory relay.

"The resistances and supervisory relays are mounted on plates set between the cord fasteners and the rack in the rear of the position, the 40 and 83-ohm resistance being combined in one coil, either of the spool type as on the older positions or the later flat micanite type.

"This brings us through the discussion of the cord circuit which may be used in connection with either an A or a B board and it may be wise to dwell for a few moments on the transition from one to the other.

"Historically speaking, a telephone exchange system passes through four distinct stages, each with its own problems and its own methods of construction, operations and maintenance.

"The first stage is where a single office with one or two switchboard positions is sufficient to handle the traffic; each subscriber's line is provided with a single jack, which serves for both outgoing and incoming calls, and all of these jacks are within the direct reach of the operator. This is the simplest possible arrangement in that each connection is handled throughout by the operator who answers the call, while it requires no multiple, no transfers or trunks, and no call circuits, with all their chances for trouble and mistakes. It is unfor-

tunately true, however, that as an exchange system increases in size and consequently in value to its subscribers, the complication of the apparatus needed to handle the traffic increases in a much greater ratio. When more than two switchboard positions are required the lines are no longer all in the direct reach of each operator and we must devise some method for connecting two subscribers whose lines terminate, for example, at opposite ends of the board. This brings us to the second stage, where a transfer or local trunking system is usually adopted as a more or less temporary expedient.

"A transfer board consists essentially of any required number of standard positions, each equipped in the same manner as before, with the addition of a number of short lines or transfers connecting the different positions. An operator receiving a call for some line which terminates in another position locals or transfers the call over one of these short lines to the position which handles the line called for, and the operator there completes the connection by plugging the transfer line through to the line desired and ringing the subscriber.

"In a standard transfer board it is necessary that the originating operator should know what position each line falls in, in order to use the proper transfer. This can be accomplished without serious confusion only by dividing all the numbers into definite groups—for example, into hundreds—and terminating each group in a separate position. Panel and jack changes, or moving a line from one position to another, are thus impossible; and we cannot distribute the load evenly among the operators or group different classes of service together.

"The third stage is a long, but expensive, step in advance, and brings us to the multiple switchboard. The principle involved here is that of limiting the use of the line jack to that of an answering jack only, and of bridging to it enough additional jacks—called, from their number, multiple jacks—distributed along the board so that each operator can readily plug into any line in the exchange. This enables her to complete every connection directly; and brings us back, in this respect, to the very desirable simplicity of the single position board. It also enables us to distribute the answering jacks in any way desired, grouping the different classes of service together and equalizing the load on the operators, and thus renders the system far more flexible and efficient.

"Although almost ideal in its efficiency and simplicity of operation, many causes combine to limit the general usefulness of the multiple switchboard. Perhaps the first of these which in practice becomes serious is the impossibility of furnishing commercial economical service to a large number of subscribers over an extended territory, from a single exchange. The second is the limited number of jacks which can be placed in one multiple within the reach of an operator. These two practical difficulties, with others, bring us to the fourth stage, where we now stand in large cities.

"In the congested district, the first difficulty is now not serious, and the second can be met by the installation of a second unit. Owing to line expense and transmission trouble, however, the amount of territory which can be satisfactorily served by a single exchange is limited, and it long ago became necessary to divide large exchange systems into districts, each served by a separate exchange. To admit of connections between these exchanges, it became necessary to provide an elaborate trunking system, and the importance of this portion of our plant is rapidly increasing. A noteworthy but natural development in our experience has been that as our exchanges increased in number and size, the number of local calls within the limits of each exchange has become a small proportion of the total number of calls. This has lessened the comparative importance of that portion of the subscriber's multiple which is in reach of the originating operator to a point where it is no longer commercially economical, and in nearly all cases we have taken it out, handling all calls, whether from the same or from a distint office, on the same basis.

"*A and B boards.*—A modern large city office contains two entirely distinct switchboards; the A board, made up of answering jacks only, where all calls originate, and the B board, having multiple only, where all connections are completed. Every A board in the entire system is connected to every B board by one or more call circuits and enough trunks to carry all the calls that we are likely to have at any one time. To avoid the confusion and misunderstanding which occur when a subscriber is required to repeat his number to a second operator, the A operator does this for him by pressing a key, either of the No. 69 or No. 242 type, which bridges her set across the call circuit, terminating in the receiver of a B operator at the desired exchange. She then repeats the name of *her* exchange and the number called for, and the B operator answers with the number of a trunk. The A operator then releases her call circuit key and plugs her subscriber through on the designated trunk, while the B operator, after testing the sleeve of the multiple jack of the subscriber called for with the tip of the plug in which this trunk terminates, and finding it clear, completes the connection by inserting the plug. The subscriber is then automatically rung by a group of relays until he answers, when the increase in the flow of the ringing current trips a relay, cutting off the generator and closing the trunk through for talking. The talking current is supplied through a supervisory relay which controls, not a lamp at the B end, but the cord lamp on the originating A board. The B operator cannot listen in on any connection nor can she be flashed by anyone except the A operator. If a trunk is connected at one end only, its guard lamp on the B board is lighted. This prevents a subscriber from being hung up on a trunk, a frequent and very annoying occurrence with many of the old transfer systems.

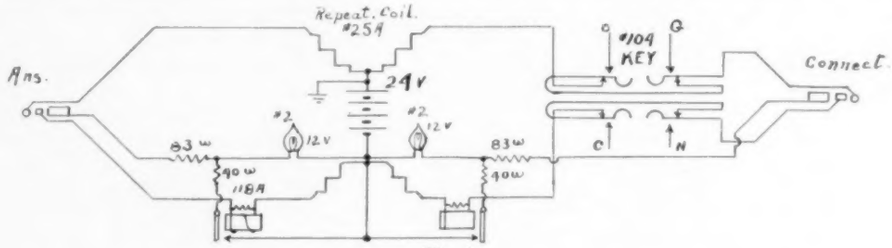


Fig. 65.

"*Importance of calling circuit.*—The call circuit is evidently the most important individual factor in this

arrangement. If an A position or a trunk is out of order, the traffic can be handled by those adjoining, while if a call circuit is in trouble, direct connection between the A and B boards is cut off entirely, and only a limited number of connections can be completed in a very slow and unsatisfactory manner by taking a trunk and depending on the guard signal to ensure its being picked up by a supervisor. A report of Can't get Main, or some other office, is the most startling and serious report that will ordinarily come to a switchboard repairman, and one which calls for instant and effective action.

"Transmission losses—Line loss.—Important as it is, the call circuit is of necessity working under transmission conditions far more trying than those in any other circuit in use, except perhaps a few long distance lines; and the problem of securing accurate and satisfactory service over it is difficult and discouraging, especially when the mileage covered in our Chicago system is considered. The maximum loss which our standard of transmission will allow is the equivalent of 18 miles of No. 19 gauge cable, having a capacity of .054 microfarad per mile or a total of .97 microfarad, and a total resistance of 1584 ohms. The transmission loss in any circuit is proportional to the capacity multiplied by the resistance, and hence increases in a far greater ratio than the length. Remembering this, and also the fact that the capacity of the office wiring to the keys multiplied in every position of the A board is itself a serious item, if you will recall the routing of some of our long bunched call circuits, where the A boards of several offices are bridged to the same circuit, you will realize something of the importance of this source of loss. The close watch which we are now keeping on the grouping and routing of all call circuits has resulted in a marked improvement.

"Shunting Loss.—In a shunt or divided circuit a continuous current will, in accordance with Ohm's law, divide in inverse ratio to the resistance of the various paths offered to it; that is, the lower the resistance of any path is as compared to that of the others, the larger the amount of current which it will receive in proportion to the others. With alternating or fluctuating current, such as speech waves, the law is still true, except that for resistance we substitute impedance, or the apparent resistance which the circuit offers to the particular type of current used, and which is a combination of simple resistance, self-induction, and capacity. The impedance of a telephone circuit is always greater than its simple resistance, and where either the self-induction or capacity is considerable, it may be many times greater. For speech waves then, Ohm's Law becomes:

$$\text{Effective Current} = \frac{\text{Effective Electro-Motive Force}}{\text{Apparent Resistance or Impedance;}}$$

and, in a shunt circuit, they will divide in inverse ratio to the impedance of each path.

"This brings us to the most serious transmission loss on call circuits and one for which a remedy seems impossible. When two A operators are on a circuit at the same time, the set of one forms a shunt across the connection between the other one and the B operator at the distant office, and the speech waves which carry the order divide between the set of the listening A operator and that of the B operator in inverse ratio to the impedance of each path, that of the A operator, of course, being usually much the less. When, as is frequently the case during busy hours, several A operators are on the circuit at the same time standing in line to give their orders, it is evident that but a small portion of the speech waves reach the B board. As we increase the load on our operators by improving our trunk circuits—providing automatic ringing and other changes which enable an operator to handle more trunks than formerly—this loss naturally becomes more serious.

"I have gone into these principles and problems somewhat in detail in order to emphasize the fact that as the transmission losses are necessarily great it is important that the small amount of energy received at the B end should be used to the best possible advantage, both by correct design and by careful maintenance of the apparatus.

"Besides transmission, there are two other points which must be covered in a cell circuit. As the B operator has no listening key, the simple busy test used on the A board is not available, and this must be cared for in some other way. Where the traffic at night does not warrant keeping an operator in the B position, some signaling device must be provided to indicate when an A operator is on the circuit, this device to be switched out during the day.

"Apparatus Losses.—There are two distinct sources of loss in any telephone circuit which can be designed. First, a portion of the speech fluctuations coming from the distant station are absorbed by the transmitting portion of our own instrument and are thus wasted, instead of being all converted into sound in the receiver. Second, a portion of the fluctuations set up by our own transmitter are absorbed and reconverted into sound waves in our own receiver, instead of going out on the line, causing side tone, which not only is a dead loss, but which, by reproducing in our receiver the sounds picked up by our transmitter, drowns out to a greater or less extent the weaker fluctuations coming over the line from the distant instrument. Broadly speaking we can have both the transmitting and the receiving portions of our apparatus in circuit at the same time only by connecting them either in series or in parallel, or by some combination of the two arrangements. Many ingenious plans have been tried in an attempt to reconcile, as far as possible, these two conflicting but equally essential factors; but every arrangement which has been devised can, by proper analysis, be reduced to either a series, a bridged, or a combination circuit."

"Your story is so interesting I dislike to interrupt it," said the President. "But the hour is late and I think we must continue at our next meeting. A motion to adjourn will be entertained." Motion made and carried.

(To be continued.)

Norwegian Statistics

The number of telegrams transmitted in Norway during the year 1913-14 amounted to 3,870,000, or 73,000 more than during the period 1912-13. Telephone messages over long distances numbered 6,270,000, an increase of 688,000 as compared with the previous period. There are now nearly three messages per capita, which probably represents a record. The total revenue from the telegraph and telephone lines amounted to $3,595,000, as compared with $1,969,000, and the working expenses amounted to $1,553,500, as compared with $1,436,000 during 1912-13. The surplus was $58,440, as against $53,570 for the previous period. The total capital spent on telegraph and telephone lines amounted to nearly $10,000,000, and the sum added during the last period was about $1,008,000.

European Telephone Development

Translations from the Foreign Press and Communications from European Engineers

BY FRED W. SCHOLZ

THE dielectric strength and the capacity within the frequency f=350 to 4,800 per second (corresponding to ω= 2,200 to 30,000), were studied for a number of temperatures. The curves shown in the Figs. 1 to 5 give the results of the experiments.* These curves allow us to draw the following conclusions: Pure gutta percha has, at the temperatures when it is used in actual practice, i. e., from 0 to 15° C. (32 to 59° F.), a considerable dielectric loss (Fig. 1). The temperature curve of the angle expressing the loss shows a maximum for telephone currents (ω=2,200 to 10,000), at temperatures ranging from 32 to 50° F. With increasing temperature the dielectric loss falls rapidly at first, then slower and tends towards a minimum value, which seems to lie near a temperature above 40° C. (104° F.). This point was not reached, however, in the tests. Heating telephone cables beyond this temperature would not be permissible in practice, since the insulating material would become soft.

An addition of 40 per cent green gutta percha has (Fig. 2), the noteworthy effect, of displacing the entire system of capacity and dielectric loss curves in the direction of decreasing temperatures. This is equivalent to a considerable improvement in the utilization of the gutta percha at the temperatures used in practical work. The question is, what is the cause of this effect? It is well known that the green gutta percha excels through an abnormally small percentage of resin (only about 8 per cent) and this leads us to believe that the improved effect is due to the decrease in resins. That the amount of loss does not depend alone on the resin percentage in general, but that the quality of the resin has its effect as well, is shown by Fig. 3, where balata with 48 per cent resin is used. In this material the curves seem to be displaced towards the left, compared to the preceding curves. Even in the balata, the dielectric strength can be improved by removal of more resin, as is shown by Figs. 4 and 5, where the balata has from 22 to 33 per cent resin. We see that the dielectric losses decrease at the same time with the resin percentage. A further confirmation of this statement is shown by Fig. 5, taken after 15 months time, when the resin percentage had increased to 48 per cent.

A corresponding result is shown in the investigation of a mixture containing very little resin, the mixture being 67 per cent balata and 33 per cent green gutta percha. The mixture contains only a trifle more resin than the balata insulation in Fig. 4 and is near the same in dielectric constants. We may conclude that the gutta percha and balata materials could be improved still further by further deresinizing processes. Manufacturing cables of such mixtures is extremely difficult, however, owing to the tenacity of the material.

4. Measurements with balata resin: The results of the experiments made with balata made it advisable to examine the dielectric characteristics of the resin itself. This showed that the dielectric loss of the resin for temperatures up to 30° C. (86° F.) was still lower than that of the best (with very little resin) balata (Fig. 4). It changes also with the temperature and the frequency. This shows also that the dielectric fatigue of a mixture need not be in direct proportion to the fatigues of the various components in the mass, and that reliable figures have to be obtained by direct tests with these components and cannot be obtained by simple estimating.

5. Influence of Time: The alternating current measurements with these insulating materials also showed the influence of time on the dielectric effects. The capacity increases slowly, whereas the dielectric loss, aside

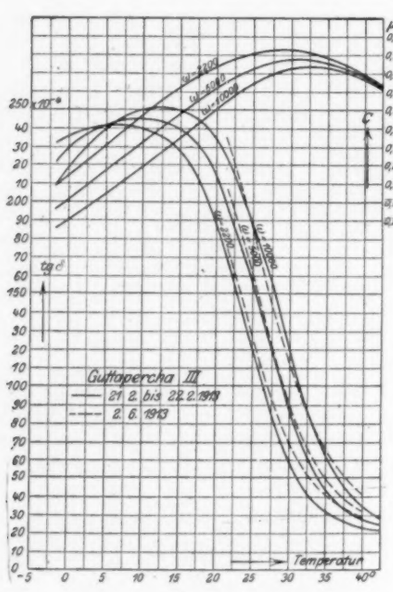


Fig. 1.

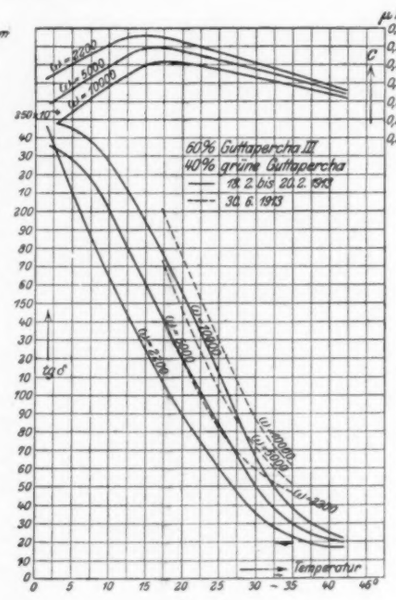


Fig. 2.

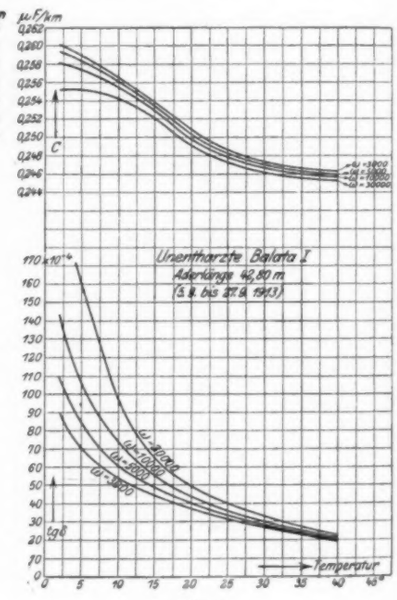


Fig. 3.

*Dielectric Properties of Insulating Materials—(Continued).

from the time immediately after the completion of the cable, changes very little. (Compare the full drawn with the dotted curves in Figs. 1 to 5). Fig. 6 shows one cable where more detailed studies were made.

6. Practical Effect of Insulating Resistance: If we compare the results of measurements with alternating current to those with direct current, we see that the usual determination of the insulating resistance—one minute after connecting to current circuit—gives no opinion regarding the amount of the dielectric losses of a cable. It often happens that of two conductors in a cable, that with lower insulation has smaller dielectric losses than the other one. The magnitude of the dielectric loss gives us the damping effect through leakage and thus shows whether the cable is fit for telephone work or not. When we compare the losses through dielectric losses with those due to insulating resistance we see how insignificant the latter is, and find again how little importance need be given to a high value of insulating resistance in telephone work.

7. Measurements with Gutta-Gentzsch: The artificial gutta percha made by a process patented by Gentzsch was also tested, a light brown and a darker plate being used for the tests. Fig. 7 shows the results obtained with the darker plate, the lighter one acting similarly. At a temperature of 18° C. (64.4° F.) and probably at lower temperatures also, the artficial gutta percha is better than the natural product as regards dielectric losses. In this respect it seems better fitted for telephone work. The low dielectric constant also speaks in favor of this material. The possibility of introducing this material for telephone cables seems worthy of investigation, since a change in the mixture may lead to even better results.

8. Practical Results for Telephone Cables: If we wish to compare the results of the investigations with these insulating materials to their usefulness for telephone cables, we must distinguish between cables with permanently fixed and constant inductance and those having induction coils introduced. In those cables using induction coils the minimum damping effect is proportional to $f_s = \sqrt{\epsilon}\sqrt{tg\,\delta + \frac{1}{\omega\tau}}$, in which ϵ is the dielectric constant; δ the angle of loss of the dielectric and τ the time constant of the coils. It is presupposed that the coils used are of the same type.

For coils that are built into submarine cables, the maximum value of time constant, obtainable at this time might be $\tau = 0.02$ s. With a frequency of $\omega = 5{,}000$, the equation would become $f_s = \sqrt{\epsilon}\sqrt{tg\,\delta + 0.01}$.

In Table 2 the values of ϵ, $tg\,\delta$ and f_s are compiled for a few insulating materials for a temperature of 15° C. (59° F.) and a circuit frequency of $\omega = 5{,}000$.

TABLE 2. DIELECTRIC CONSTANTS FOR VARIOUS INSULATING MATERIALS.

Material—	Dielectric Constant E at 59° F. & $W=5000$.	Capacity Factor tgS	fs for $T=0.02s$.	fs for $T=0.04s$.	fk (Also fs) for $T=00$.
Gutta percha I.	3.16	0.0234	0.325	0.300	0.272
Gutta percha II.	2.99	0.0244	0.322	0.297	0.271
Gutta percha III.	3.07	0.0240	0.323	0.299	0.272
60% gutta percha III; 40% green gutta percha.	2.18	0.0160	0.288	0.254	0.226
Rosinous balata I.	3.39	0.0048	0.224	0.183	0.128
Balata II.	2.93	0.0042	0.204	0.164	0.111
Partly derosined balata I.	2.99	0.0038	0.203	0.162	0.107
Strongly derosined balata I.	3.14	0.0026	0.199	0.154	0.090
50% gutta percha III; 50% balata I.	3.13	0.0104	0.253	0.220	0.181
67% partly derosined balata I; 33% green gutta percha.	3.24	0.0035	0.209	0.165	0.107
Gutta gentzsch, dark.	2.53	0.0065	0.205	0.171	0.128

For telephone cables with constantly distributed inductance (copper conductors wound with iron wire), the minimum damping effect possible is proportional to the equation: $f_k = \sqrt{\epsilon}\, tg\,\delta$. The values for these various materials and for this magnitude can also be seen from Table 2. The values f_k are in practice of rather doubtful value, since it is impossible to increase the inductance of cables wound with iron coils to increase far enough to reach the minimum damping effect. Table 2 shows that the more or less deresined balata materials, a mixture of balata and green gutta percha and the Gutta-Gentzsch are of equal value for telephone cable insulations. The formula for f_s shows that a further decrease of the values $tg\,\delta$ for telephone cables with induction coils has very

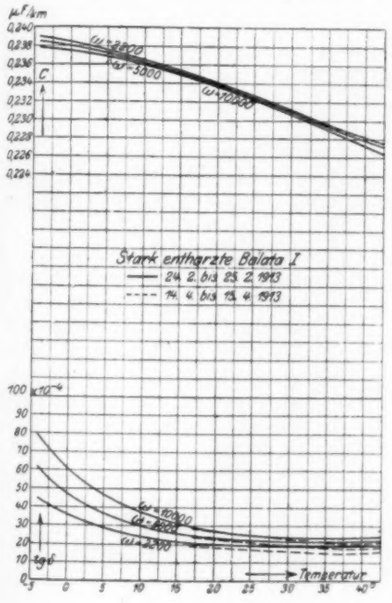


Fig. 4.

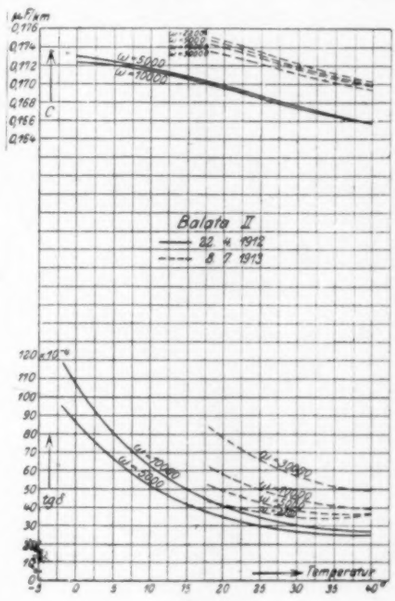


Fig. 5.

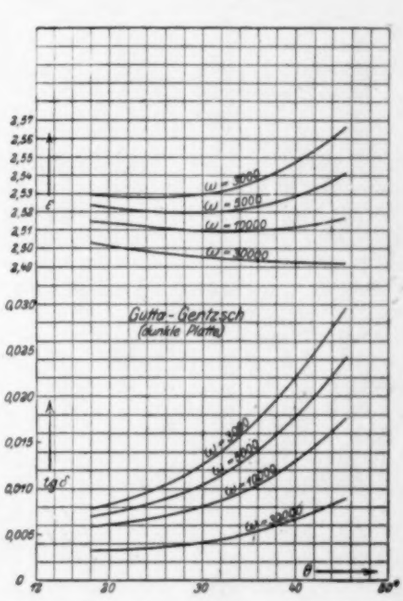


Fig. 7.—Dielectric Changes of Artificial Gutta Percha.

little use, as long as the time constants of the coils cannot be increased much above $\tau=0.02$s. If it were possible to use coils with a time constant of $\tau=0.04$s for submarine telephone cables, the equation would become: $f_s=\sqrt{\epsilon}\sqrt{tg\,\delta}+0{,}005$.

The values figured on this basis are also shown in Fig. 2. It is clear that materials with specially low dielectric losses show up better, if coils with a high time constant are used. The improvement of the coils seems to be one of the biggest problems for the improvement of the dielectric characteristics of insulating materials.

Experiments With Rubber and Hard Rubber: The following kinds of rubber were tested: 1, pure crude

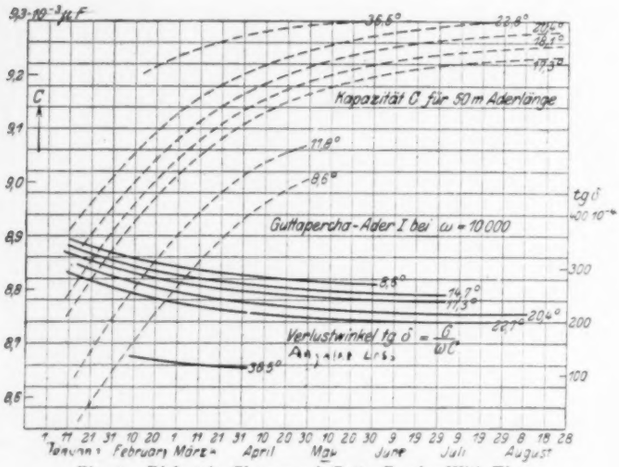


Fig. 6.—Dielectric Changes of Gutta Percha With Time.

Para rubber; 2, pure vulcanized Para rubber; 3, soft rubber for insulation of conductors, normal mixture with 33.3 per cent Para rubber; 4, hard rubber I, good quality; 5, hard rubber II, medium quality; 6, hard rubber III, poor quality. The measurements showed the same trouble as the gutta percha and balata, namely that the material that was freshly produced changed its electric characteristics with time. The soft rubber especially showed great changes in this respect; the hard rubber is better. The disruptive strength of the rubber for 50-period alternating current was also examined and it was found that for a rubber plate 1 mm. in thickness this disruptive strength lay for soft insulating rubber near 27,000 volts, for hard rubber of good quality near 40,000 volts.

Investigations With Paraffine and Ceresine: The paraffine, also called hard paraffine, is recovered from lignite tar and similar substances. It consists of heavy hydrocarbons. The melting point lies between 125 and 140° F. The specific gravity is 0.9. The ceresine is produced from ozokerite, has a spec. gr. of 0.92 and melts between 161 and 176° F. Both materials in a pure state are excellent dielectrics. Years ago it was found that the residue of pure paraffine is exceedingly small and that the dielectric fatigue phenomena often noticed on paraffine plate condensers are due to some secondary causes. Usually it will be found that impurities in the paraffine or air cushions between electrode plates and the paraffine are the cause. The ceresine gives a very low dielectric loss. For temperatures between 59 and 95° F. the capacity is only 3.10^{-5}. Under the same conditions the paraffine has a loss which is two or three times as high. A mixture of 50 per cent paraffine and 50 per cent ceresine gives a much greater loss than for either of the components separately. In a fused state, with increasing temperature the behavior of all of these materials, including the balata resin and other fusible insulating materials, approaches that of a condenser with parallel wired ohmic resistance, i. e., to a system whose capacity factor is inversely proportional to the frequency.

Investigations With Fibrous Materials.—1. Paper: In fibrous materials like paper, cotton, silk, etc., the moisture has a great effect. This is also proved by the tests with a good quality paper used for paraffine soaked paper condensors. 1. In undried state the paper with a humidity in the air of 68 per cent (measured at a room temperature of 62.6° F., has the dielectric constants shown in Fig. 8.

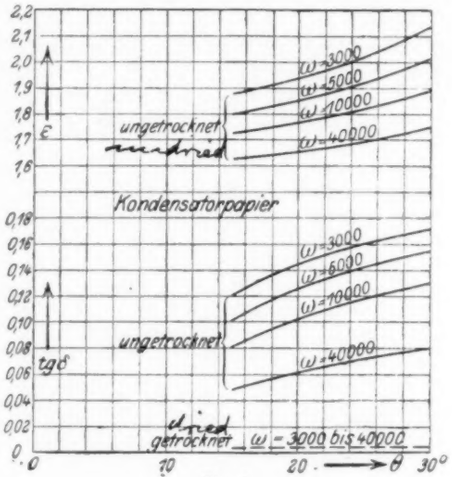


Fig. 8.

2. After careful drying at 212° F. the paper showed the approximately constant values of $\epsilon=1.14$ and the capacity $tg\,\delta=0.004$ for all frequencies between $\omega=3{,}000$ and $\omega=40{,}000$ and for all temperatures between 59 ad 86° F. This last value is also shown in Fig. 8 for the sake of comparison. In drying, the paper lost 8.6 per cent of its weight in moisture. This resulted in a considerable decrease of the dielectric loss and the dielectric constant is decreased. The dried paper absorbs water eagerly from the air so that measurements have to be made with extreme caution. 3. After the paper has absorbed 4 per cent moisture when exposed to the air, we find at the temperature of 60° F. the following results:

W	ϵ	tgS
3,000	1,262	0.0097
5,000	1,258	0.0088
10,000	1,254	0.0081
40,000	1,246	0.0075

4. The paper was placed in an undried condition into melted paraffine at a temperature of 127.4° F. After the paper had absorbed all the paraffine possible, it was taken out of the bath and measured after cooling, giving the results in Table 3.

TABLE 3.

Temperature		*Saturated at 127° F.*		*Saturated at 293° F.*	
ϑ	w	ϵ	tg d	ϵ	tg d
16°	3,000	1,974	0.0417	2,128	0.0179
	5,000	1,944	0.0359	2,117	0.0151
	10,000	1,916	0.0291	2,106	0.0121
	40,000	....	....	2,089	0.0086
25°	3,000	1,957	0.0505	2,107	0.0249
	5,000	1,924	0.0451	2,092	0.0207
	10,000	1,887	0.0377	2,076	0.0165
	40,000	....	.....	2,054	0.0109

5. A second saturation experiment was made in a bath of 293° F. At this high temperature a considerable portion of the moisture in the paper evaporates and a considerable portion of air escapes out of the paper. The first effect mentioned probably reduces the capacity

down to one-half, whereas the second factor tends to increase the dielectric constant in spite of the loss in moisture. The capacity factor measured in this second saturation test is much better than even the values in the best paraffine paper condensers. This proves that the saturation through mere laying of the paper into the paraffine bath is not sufficient. The paper has to be

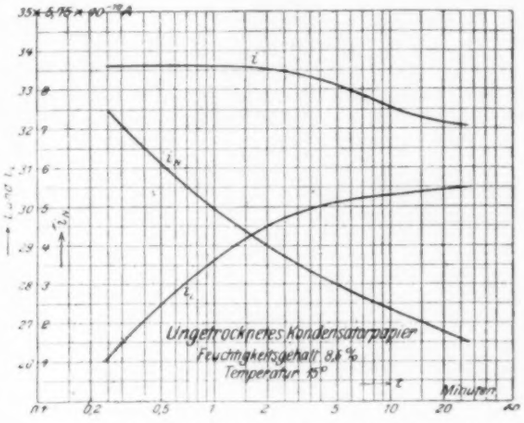


Fig. 9.—Action of Condenser Paper Tested With D. C.

dried thoroughly before this is done. The best result is obtained when drying and saturation are carried on in a vacuum; capacity factors of 0.005 are reached in this last process without trouble.

In the unsaturated paper the charging and discharge test with direct current gives quite a different picture. In its natural state the paper has a considerable conductivity factor, owing mainly to the water absorbed. This conductivity decreases and increases almost proportionally with the degree of moisture. The conductivity depends in addition also on the arrangement of the water in the capillary spaces of the paper. This arrangement of water changes under the effect of an electric field. The capillary water films seem to condense with an increasing field strength. This takes place because of the change of surface tension under the influence of the electric field. The conductivity therefore increases with increasing electric voltage. Fibrous materials containing moisture have proved empirically that the conductivity G_0 increases with the square root of the voltage applied. This effect of the field on the paper takes some time and for that reason care must be taken in measuring the effect of current after sufficient time has been given to make the effect felt in the material. Fig. 9 gives the results of measurements with the unsaturated condenser paper; i_N gives the pure fatigue current; i is the charging current. The difference $i—i_N=i_L$ therefore gives the real current applied. The dielectric loss is here dependent on the voltage used, and is greater in proportion as the frequency is smaller.—*Kaiserl. Telegr. Amt.*

USING HIGH TENSION CURRENT FOR CHARGING OF BATTERIES.

In cities using direct current it is not feasible to use transformers in place of the troublesome primary elements. The following system offers a practical suggestion and substitute. The principle is this, that secondary batteries are very suitable for feeding of all sorts of signal and calling currents and those currents used in telephone work, provided arrangements are made for automatic feeding and recharging of the batteries. The advantages of secondary batteries are mainly these: constancy of voltage, low internal resistance and consequently capacity to stand overloads. In contrast to primary elements, the normal current load on the secondary batteries can at times be increased to many times the normal load without injuring the system. The new system, in which no attendants are needed, is shown in Fig. 10 in diagram form.

The low tension plant, here the telephone plant, is designated by letter K and the keys T, which are fed from the storage battery set B_1. In the current circuit of the battery B_1 lies the winding R of a relay, which operates the switch U with the points of rotation c, b. The connection to the high tension feeders ends at the contacts a, b of the switch U. In the figure the system is at rest position and a small auxiliary battery B_2 is connected parallel to the operating battery B_1 by means of contacts e, f and a damping resistance W_2.

If the calling bell K is connected by pressing on key T, then the low tension current circuit is closed. Current flows from the positive pole of the battery B_1 by way of K, T and B back to the negative pole. Through this the relay R is excited and attracts the double armature, doing this continuously and not intermittently as would be expected from the ordinary construction. Through this movement the contact at e and f is broken, i. e., the auxil-

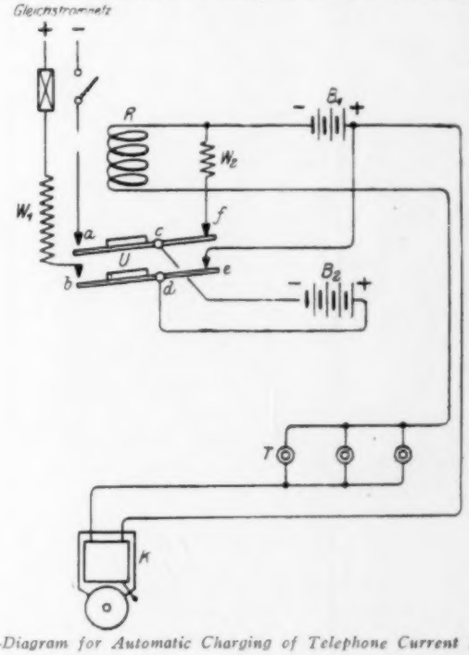


Fig. 10—Diagram for Automatic Charging of Telephone Current Batteries.

iary battery is completely disconnected from the low tension current circuit. On the other hand the contact is now closed at a and b. Consequently a charging current, whose magnitude depends on the amount of resistance in W_1 flows into the battery B_2. While B_1 is discharging, B_2 is being charged. If current consumption from the battery B_1 ceases, the relay armature falls away, the contact at a and b is broken, and at the same time the auxiliary battery B_2 is connected in parallel to B_1 by way of e, f and W_2. It now gives off the charge obtained from the high tension circuit to the latter. The resistance W_1 is selected in such a way, considering the high tension voltage of course, that B_2 at charging takes in a higher tension current than is given off at the same time by B_1

to the low tension plant. As the time for charging of B_2 takes exactly as long as the discharge of B_1, we have always more current flowing into the battery set than is taken from it. On the other hand there is no danger of overcharging the battery for this reason: The number of cells in B_2 is greater than that in B_1. Consequently B_2 must always discharge strongly as long as it is connected in parallel with B_1, while the latter reaches the full charging limit. Consequently B_2 is never overcharged. The current flowing from B_2 after parallel connecting with B_1, to the latter, is regulated by the resistance W_2 in such a manner that there is no danger of overcharging the cells of B_1 either. Experience has shown that strong charging of B_1 protects the plates against sulphation and that the excess of current is used for forming a protective gas film which increases the life of the cells. Moreover we have under these conditions charging periods which are very short. The cells of the auxiliary battery B_2 are used as conductors of very small charging currents and can therefore be chosen of very small capacity. But even the cells of the operating battery B_1 need not be very large.

The system described was chosen in order to prevent high tension current from passing into the low tension current circuit of telephone and other plants and causing disturbances. According to specifications there must be no direct electric connection between high and low tension current systems. This is not the case in this system, since the battery B_2 during charging from the high tension wires is disconnected from the low tension system by both poles. Only a system like the above makes it possible to charge a battery from such a source without special supervision. The life of the lead cells was found to be very high, because it is possible, due to the low capacities used, to work with a small acid concentration and large distance between plates. Since the loads are only short and of short sudden impulses there is no danger of overheating or boiling of the acids. The cells require practically no ventilation during rest periods and this in turn prevents evaporation of acid. By using cells with a high acid volume it is possible to work for a very long time without adding water to increase the volume.

The equipment can also be changed so that the relay R is connected in parallel instead of in series with the apparatus in the exchange. This would make the operation of the relay independent of the resistance conditions in the system. If the current consumption surpasses the permissable factor only rarely and then for short periods, it is not necessary to take special precautions for additional feed current, since there is a slight excess of current at hand even without special equipment, as was seen before. If, however, the load is liable to vary very much, a second relay will have to be connected in series with the first one, whose armature in the operating position will short circuit a part of the resistance W_1 so that a stronger charging current is given. The above system has been tried out in numerous low tension current plants and has given excellent and safe service.—*Elek. Zeit.*

IMPROVEMENTS IN TELEPHONE SERVICE.

The proposed improvement in European telephone service takes up a question that has given most telephone managers quite a little trouble, namely the problem of wrong connections. Most of us know how disagreeable it is to be in a hurry for a number and then have the operator give us the wrong number. While the public ought to be a little lenient in that matter, considering that with so many connections to be made, an operator is bound to have one or more wrong, nevertheless the truth is that most of us get out of patience and say things about the poor service of the company and other appreciative remarks.

The author proposes picking out those numbers that are most frequently confused owing to their similarity in sound, like *one* and *nine*, *5197* and *5997*, etc., and installing a separate connecting system for these harassed subscribers. The problem of giving the complaining subscriber a different number does not meet the question, since the vacant number would simply be changed to another subscriber and the difficulty would still be there. It was tried in several exchanges to plug the multiple jacks with the supervisory plugs. But this would increase the number of plugs in the multiple panels to an alarming extent, and in addition the supervisors would

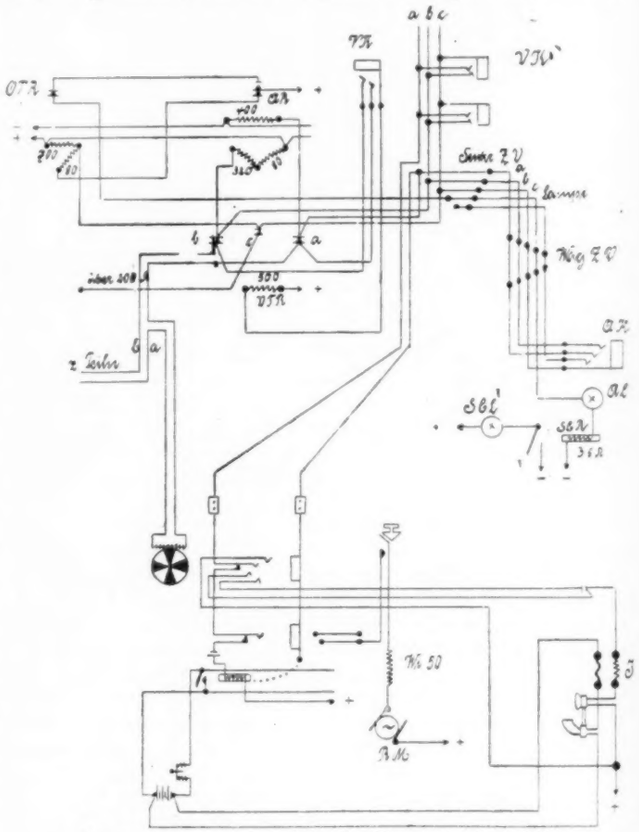


Fig. 11—Wiring for Correction of "Wrong Number" Evil.

extend their activity to a field in which they have no call and would have less time for their proper work of supervising and controlling operation. The diagram shown in Fig. 11 is the suggestion offered by a Charlottenburg telephone engineer.

The *a*-conductor of the connecting wire is interrupted at the vertical intermediate distributing board and is looped with an indicator drop of a special drop switchboard. In addition a special cut-off signal, showing at the special indicator switchboard, is connected at the distributing board to the *a*-wire of the subscriber's line. This cut-off signal is visible at this board every time that the subscriber in question lifts his receiver. If a connection is made with a line ending at such a switchboard, the call comes in not at the ordinary operator's place, but at this special board. The operator answers and asks

whether this special number is desired. For greater safety the name of the subscriber and also that of the district is added to her question. If the calling subscriber answers the question in the affirmative, the operator calls the desired special subscriber's line and makes the connection. In this system the subscriber can always call the exchange. On the other hand no calls can be made with his telephone except through this special switchboard. An advantage is, that at night or during low traffic periods the special subscribers can be connected directly to the regular traffic switchboard. It is estimated that in a small exchange there are hardly more than 10 subscribers that are constantly troubled by wrong numbers and that consequently only small units need be installed for their benefit and that the ordinary operator could attend to these few special wires along with her regular work. This system has been used in one of the Berlin suburban exchanges for about six months and answers the problem quite well. Of course any one can readily see flaws in this solution, but for a smaller exchange it might very well answer and would show in addition that the telephone company is willing to do all within its power to make service as perfect as possible.—*Telgr. u. Fern. Tech.*

TELEPHONE SERVICE IN SWEDEN.

Sweden has about the best and most extensive telephone service in Europe, in comparison to its population and size, and is only surpassed proportionately by the United States, and by one other country in Europe, namely Denmark. The first telephone system was placed in service in 1880 by the Stockholm-Bell Telephone Company. At the same time service was begun in Malmö, in Gotenburg and other smaller cities. In order to open government communication between different centers and offices a second government system was started in Stockholm in 1882. A few years later independent private telephone companies were organized all over Sweden in the form of associations. These associations formed by a larger or smaller number of persons interested in the progress of the telephone had a tremendous influence on the development of service. Usually these associations within a certain district would communicate with similar societies in nearby towns and would pool their investments and purchase supplies on a larger scale. Then each association would take the apparatus for its needs, build its own lines and run them independently. The administration and management was usually in the hands of a committee chosen by the members of the association. This committee served without pay. Consequently the only expenses were those for operators and repairmen and the telephone tolls were very low and telephones were found in a large number of homes. In larger cities these associations very soon grew into incorporated companies that operated the system like any other business organization and distributed the profits as is the case in any investment. The tolls were, of course, higher, more so since the cities made more demands as to quality of service and equipment. Around 1890 the private association telephone plants had an extent of some 24,000 miles of wire and about 16,000 telephones. Towards the end of 1900, the state owned and operated telephone system had about 52,000 telephones in service; the Stockholm corporation about 27,000 telephones and other private companies some 5,000 telephones. The total number of telephones in Sweden at this time was about 84,000, making about 16 telephones per 1,000 inhabitants. At that time the average number of European telephones was about two per 1,000 capita. The total length of wire for all of Sweden at the time was about 96,000 miles. At the end of 1912 the statistics had changed as follows: The state owned telephone service operated 148,372 telephone instruments; the Stockholm private company, 68,163, and other private companies some 1,019 telephones. This makes a total of more than 217,500 telephones in use, which means 38.8 telephones per 1,000 capita. The length of telephone wires was 301,655 miles. For comparison it may be mentioned that Denmark at that time had 39 telephones per 1,000 capita; Norway, 27; Switzerland, 22; Germany, 18; Great Britain, 15; Netherlands, 12; France, 7, and Belgium, 7 per 1,000 capita. In all of Europe there were at the time 3,330,000 telephones in use, corresponding to eight telephones per 1,000. As regards cities, Stockholm comes first with 211 telephones per 1,000, then Copenhagen with 76; Christiania with 71; Helsingfors with 59; Berlin with 59; London with 30 and Paris with 29 per 1,000. At the end of 1912 the telephones in Stockholm had increased to 228 telephones per 1,000 capita.

A. T. & T. Large Shareholders Increase Holdings

The stockholders' list of the American Telephone & Telegraph Company as of April 1, 1915, shows several interesting changes in shareholdings among the large owners during the past year of financial stress. Naturally in such a period there is a good deal of shifting of investments. However, among the large stockholders of the American Telephone Company changes in ownership of the shares have been almost entirely increases. There is a surprisingly large number of women stockholders, while thousands of shares are held by trustees.

Directors of the company added to their holdings last year. They increased from 46,644 shares to 47,014 shares. Of the directors, U. N. Bethel increased his share interest from 1,800 to 2,383. G. P. Gardner added 333 shares, now owning 1,693 shares. C .E. Hubbard is credited with 1,018 shares, against 867 shares last year. E. V. R. Thayer now owns 273 shares. Last year he was listed with 207 shares. Shareholdings of other directors were unchanged.

Arthur A. Marsters, Thomas J. Perkins and F. A. Stevenson, trustees under mortgage and declaration of trust between the trustees and the American Telephone Company dated March 17, 1915, are credited with the largest stock interest in the American Telephone Company with 103,000 shares. The largest individual stockholder, however, is Joseph J. Slocum of New York. He is credited with 20,400 shares, the same as last year.

George F. Baker, a director of the company, ranks as the second largest individual stockholder, with 16,760 shares, unchanged from last year.

The Atlantic & Pacific Telephone & Telegraph Company appeared on the list last year with 128,279 shares. This year the company is listed with 19,336 shares. The Bankers' Trust Company of New York, as trustee, holds 55,314 shares, as compared with 55,948 shares last year.

The budget for the German empire for 1915 has the following interesting amount: $1,250,000 were granted for building a large underground telephone cable system to the west. A total of $4,500,000 was granted for new construction of telephone and telegraph lines, mostly telephone. Two million dollars were granted for changing overhead telephone systems to underground systems.

Public Utility Commission News

Reports Concerning the Activities of State Regulating Bodies in the Telephone Field

New York

NEW York Public Service Commission has issued a circular letter concerning the cancellation by the the telephone company of a number of obsolete contracts not in conformity with the recently adopted rates in New York city. While in some instances the cancellation of these old contracts means an increase in telephone cost for the subscribers which held them, the commission points out that these old rates are in distinct violation of the provisions of the Public Service Commission's law against discrimination. The holders of these old contracts will be merely placed on a par with all other users of telephones in the city, on rates which are generally admitted to have been made fair.

The cancellation of these old contracts has nothing to do with the recent rate case in New York city. The circular letter of the commission says:

> In the cancellation of all discriminatory and preferential contracts, the telephone company by its own action has relieved the commission of the duty which the legislature evidently contemplated should sooner or later be performed through the issuance of an order requiring precisely such action if, after the lapse of a reasonable period—and it would seem from every point of view that the five years which have elapsed since the enactment of the law must be considered such reasonable period—the corporation itself should not have acted upon its own initiative. The manifest spirit and intent of the law is that no discriminatory contracts or practices which afford one telephone subscriber or locality any advantage over other subscribers or localities similarly situated, shall be permitted; and the statute has been construed by the commission as intending that within a reasonable time after its enactment all such discriminatory contracts and preferences shall be terminated and discontinued.

Last June the telephone company proposed to terminate these contracts, but the commission held up this action until the character and number of existing contracts providing for rates less than those fixed in the established schedules could be ascertained. It has now been found that far from constituting a general raise in telephone rates or anything like it, the cancellation of these old contracts will but place about seventeen hundred subscribers now holding old contracts for low or flat rate service, or the same basis with the more than half million other subscribers in the city of New York.

The commission has also instituted an investigation of the practice of the New York Telephone Company in charging a different toll rate for a "particular person" method as compared with the "two-number" call. Complaints were filed with the commission that more was charged for a "particular person call" between Rochester and Buffalo than for a "two-number" call, and a similar complaint was made with regard to calls between Thiells and New York city.

The commission's division of telephones and telegraphs also reported that this practice was generally provided for in the tariffs filed by the company with the commission and covering business throughout the state, that this extra charge is not constant but varies, and in many instances is increased when the message continues beyond the initial period.

The commission set a date for a hearing at which time testimony and arguments may be presented. The grounds specified in the commission's order for the hearing are as to whether or not any of the extra or overtime rates are unjust or unreasonable, whether they are unjustly discriminatory or unduly preferential or in any wise in violation of law, and whether or not the commission would be justified under the law in investigating and possibly changing some of these rates and charges as provided by commissions' law.

On the opinion of Commissioner Carr the New York commission has decided that the charge of fifty cents a month for extension telephones is not an unjust or unreasonable one. The decision is on a complaint against the New York and Vermont Home Telephone Company. The New York Telephone Company was allowed to intervene as a party in interest and its studies and the investigations of the commission have taken much time. The commission previously decided that a telephone subscriber has not the right to install his own extension telephone set as the telephone company is responsible for the standard and efficiency of service which might be interfered with by equipment over which it had not control.

An interesting phase of the situation brought out by the witnesses of the telephone company is that the placing of an extension telephone increases the number of messages fifteen per cent on a flat or message rate line.

Taking this percentage of increased business as a basis for the added cost to the company of the extension telephone, further studies all over the state led the telephone witnesses to testify that the added traffic expense was 59.5 cents per year, the added commercial expense 69.2 cents and the annual plant charge $3.13.

Mr. Carr further states in his opinion that the charge of fifty cents a month is the usual charge for extension telephones throughout the state of New York, and, as revealed by the commission's investigation, throughout the entire country, though in some instances the charge is more, running as high as $1 for residence and $1.50 for business extensions. In no instance of the many where these charges come under regulatory commissions, it is noted, have the rates been reduced.

Minnesota

After July 1, in accordance with the Minnette law, all telephone companies in Minnesota will come under the jurisdiction of the Minnesota State Railroad and Warehouse Commission.

Many companies in this state anticipating the regulations required by the Minnette bill, namely, of filing a notice with the commission of proposed rate increases, have already raised their rates.

It is stated that telephone companies may make any raises in rates they deem advisable until July 1, when the commission will have full power to pass on all further requests.

Colorado

The Mountain States Telephone & Telegraph Company is to be thoroughly investigated by the State Public Utilities Commission to determine the validity of its rates and service and the regulations and practices affecting them.

A hearing has been set for January 13, 1916, until

which time the engineering forces of the commission will be employed in making a complete appraisal of the property which the company owns in Colorado, with a view to determining whether its rates are excessive or not, and also to ascertain what reforms should be instituted to render the service satisfactory to the people and not unduly remunerative to the company.

The whole investigation is to be perfectly fair with the company and its patrons. It is undertaken at the instance of the commission entirely, based on complaints of various natures from all sections of the state.

Maine

The Moosehead Telephone & Telegraph Company, the New England Telephone & Telegraph Company, the Northern Maine Telephone & Telegraph Company, and the Moosehead Telephone Company filed an application for an order of the Maine Commission authorizing the first-named corporation to purchase certain franchises and properties of the last three petitioners, and for the last three to sell to the first. Amendment was subsequently filed, based on an error in the appraisal of the property to be purchased of the New England Telephone & Telegraph Company, reducing the price to be paid therefor to $120,950, and the total amount of stock to be issued by the Moosehead Telephone & Telegraph Company to $170,200, being each instance a reduction of $400.

A competent engineer, who testified before the commission, went carefully over the physical properties of the three companies which are to be united by sale of such properties to the Moosehead Telephone & Telegraph Company. He prepared and preesnted to the commission, in written form, a detailed report of all the physical property to be purchased and sold, with a value based upon each unit of such property and an estimate of the present entire value.

After hearing all the evidence presented it appeared that the sale by the New England Telephone & Telegraph Company, the Northern Maine Telephone & Telegraph Company and the Moosehead Telephone Company of the franchises and properties described in the petition, and the purchase of the same by the Moosehead Telephone & Telegraph Company, is reasonable, desirable and necessary in the interests of the public,, an order authorizing the purchase was made.

Missouri

The question of the authority of the Kinloch Telephone Company of St. Louis to charge subscribers for service three months in advance is directly raised in a complaint filed before the Public Service Commission by the General Audit Company of St. Louis.

The practice of the company of issuing contracts requiring payment three months in advance is declared to be unjust and illegal and in conflict with the intent of the commission act.

The commission is asked to make an order requiring the company to discontinue charging for service three months in advance and also to quit holding subscribers liable for damage to instruments caused by fire or other agency over which the subscriber has no control.

The commission held in the Columbia telephone case that subscribers could not be required to pay for service three months in advance. The commission previously held in a case which came up from Springfield, that if a utility company required payments in advance for service it should pay 6 per cent interest on the money.

Notice has been received by Mayor Hugh McIndoe from the Missouri Public Service Commission that hearing of an application by the Home Telephone Company of Joplin for an increase in rates has been postponed indefinitely.

The hearing was to have been held June 1. E. F. Cameron, city attorney, requested the commission to delay it for at least two weeks, and the postponement was the result of his request.

No date has been set for the hearing.

Wisconsin

On a petition filed five years ago, a hearing on the business of the Wisconsin Telephone Company will be commenced in Milwaukee by the Wisconsin Railroad Commission.

The petition alleges that the company's rates are excessive, that a valuation should be placed on its plant and that a schedule of rates should be fixed by the commission.

A valuation of the telephone company's property in Milwaukee, made by engineers employed by the commission, will be introduced in the case.

The petition alleges that the company's charge of $96 per year for an unlimited telephone is excessive and unreasonable. Complaint is made against contract conditions and an investigation is requested with a view to lower rates for service.

In its answer the company has denied the allegations set forth in the petition.

Illinois

The Illinois Utilities Commission in Springfield has approved an increase in the rates of the Kenney, Chestnut and Farmer Mutual Telephone Company. The rate has been fixed at $12 annually for all subscribers. The rate has previously been $5 annually for stockholders, $8 for those who own their own phones and $15 for renters. Under the present ruling it gives the telephone owner or stockholders no preference, but the company will probably buy all of the telephones.

Five Chicago hotels will lose approximately $10,000 each, annually, if the present system of private switchboards and booths for patrons is abolished and nickel-in-the-slot telephones are installed instead. This was brought out recently at a hearing before the state public utilities commission. The Chicago Telephone Company is seeking the abolition of the hotel exchanges.

The Palmer House, the Hotel Sherman, the Hotel La Salle, the Stratford and the Great Northern would be affected. A. R. Bone, general commercial superintendent of the telephone company, said the Hotel La Salle obtains a profit of $900 a month on its calls and the other hotels make a profit almost as great.

Mr. Bone testified that the privilege of allowing hotels private telephone operators and telephone booths was a discrimination against other subscribers of the company. He stated the hotels pay $1 a day for each trunk line and 2 cents for each call. This, he said, is discrimination, because other subscribers pay 5 cents a call.

Michigan

The proposed increase in telephone rentals by the Citizens' Telephone Company, Lowell, will undoubtedly be abandoned as a result of the hearing before the mem-

bers of the Michigan State Railroad Commission. The committee appointed by the board of trade to handle the telephone situation brings back the report that the commission appeared to be satisfied with their explanation and that an increase is not anticipated.

The Michigan State Railroad Commission has indicated favorable decision on the three main contentions of the Michigan State Telephone Company in its appeal for metered service.

Three main points were made in the company's petition to the commission. A qualified metered service, a physical valuation for rate-making purposes, and the consideration of the junked Home Telephone Company property in the rate-making valuation were the three demands which the city was expected to oppose.

Ohio

The Central District Telephone Company, Ohio, filed, June 1, a joint application asking for the consent of the Public Utilities Commission of Ohio to make a contract for a physical connection.

After considering the pleadings, it appeared that the service furnished the public will be improved thereby; that the public will be furnished adequate service for a reasonable and just rate, and that no increase in rates nor diminution of service would result. The commission therefore consented to the connection.

Pennsylvania

The Slate Belt Telephone and Telegraph Company complained to the Pennsylvania Commission against the construction by the Blue Mountain Telephone and Telegraph Company of certain lines which crossed the lines of the complainant, and of certain practices of the company in the conduct of its business. At the hearing on the complaint it developed that the respondent had not secured the approval of the commission to certain franchise ordinances enacted by some of the boroughs in which its lines had been constructed, and by consent the approval of these ordinances was submitted to the commission in the same proceeding as the complaint.

The commission found that the respondent had expended a large sum of money in constructing a telephone system in the same district as the complainant's system and in accordance with rights granted it by its charter and by the franchises of various boroughs. In view of the circumstances of the case, the commission was of the opinion that the various franchise ordinances should be approved in order to secure telephone facilities to the inhabitants of the district, and to conserve the investment made by the respondent in carrying out the duties imposed upon it by its charter and the franchises.

Idaho

The application of the Pacific Telephone & Telegraph company for permission to publish, to file and place in effect a new schedule of inter-exchange telephone rates for interstate traffic in Idaho, has been denied by the public utilities commission. The commission believes the discriminations and violations of the long and short haul requirements may be eliminated by the company without resorting to the radical change or initial period and rates as found in its proposed schedule.

The new schedule was filed according to the company's claim to eliminate discriminations. The commission believes that the minute initial period plan for conversation as proposed by the company in the new schedule will not be found practicable but will be unsatisfactory to a large number of patrons of the company unless the rate is so adjusted as to eliminate the many increases in charges for a three-minute conversation.

Massachusetts

The legislative committee on mercantile affairs has voted to report a bill on Governor Walsh's recommendation for an investigation by the public service commission of the telephone rates and service in Massachusetts, the commission to report to the next General Court. An appropriation of $15,000 is provided for the investigation in the bill.

Maryland

In the present investigation of the Chesapeake and Potomac Telephone Company by the Public Service Commission, the point at issue is the cost of reproduction. As rights of way are far more costly now than years ago, it was argued by the representatives of the telephone company that its equipment and franchises could not be reproduced at first cost.

Great variation is shown between the estimates of the experts of the commission and of the telephone company on the values of the rights of way and other franchises of the latter. The commissioners' engineers, according to the testimony, had valued the rights of way at $166,693, while the estimates of the company's experts are $347,659.

At the hearing of the rates of the Chesapeake and Potomac Telephone Company before the commission figures covering the intangible assets of the company were presented.

According to the averages that have been reached during the past hearings the total valuation will be close to $13,000,000. Next it will be determined whether the revenues received at the present rates give a fair or unfair return on this investment.

The remarkable growth of telephone service in this state—an increase in eleven years of nearly 80,000 stations—was brought out during the hearing.

Nebraska

The complaint of William J. Marquis, before the state railway commission, against the Polk County Telephone Company, Stromberg, for raising the rates paid by business subscribers from $1.50 per month to $2.50 per month, in violation of its franchise, and in excess of what would be a reasonable return upon the money invested in the telephone plant, has been overruled and dismissed by the commission, upon the condition that the company should set aside a sum out of the earnings equal to 10 per cent of the cost of the plant annually for maintaining and placing the plant in good condition, instead of 6.6 per cent, as heretofore done by the company.

The Frankel Display Fixture Company, New York, issues a booklet about Frankel electric testing clips that shows the complete line of these useful little instruments with prices. Telephone men will be glad to have a copy, which is free.

Telephone Patents Issued in May

A Brief Digest of those Current Specifications Most Interesting to Telephone Men

BY DAVID S. HULFISH

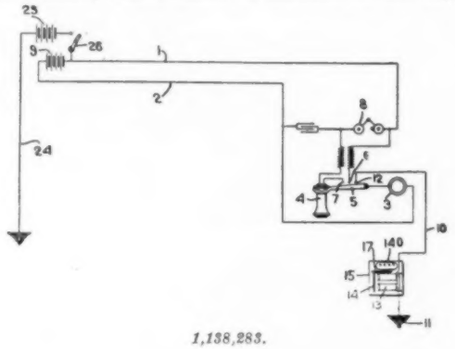
U. S. PATENT No. 1,137,865. Selecting Device for Party Lines. Issued to E. E. Kleinschmidt, New York, N. Y., assignor to Hall Switch & Signal Company. A stepping device at the telephone station is responsive to alternations of the controlling current for the purpose of stepping it forward for selection, and is responsive to a continuous current for restoring.

1,138,174. Meter. Issued to Garrison Babcock, assignor to Telechronometer Company, Rochester, N. Y. A meter or call counter at the telephone is actuated by a reversal of the current supplied to the line. To render the armature easier of attraction, it is without springs and is pushed from the magnet cores by the upward movement of the hook lever.

1,138,175. Meter Circuit. Issued to Garrison Babcock, assignor to Telechronometer Company, Rochester, N. Y. The meter is at the telephone. A shunt circuit renders the transmitter and the meter both inoperative and both then may be rendered operative by the telephone user when the response of the called telephone station is heard at the calling station.

1,138,283. Meter Circuit. Issued to W. G. Dodge and C. H. Leave, Boston, Mass. The speaking circuit is over the two wires, with the meter to earth at the telephone, the speaking battery being without earth connection, that the meter may have no current. A key at the central office adds an earthed battery of high potential to operate the substation meter, at will of the operator.

1,138,255. Test System for Faults. Issued to Herbert T. Slee, Warwick, R. I. In each current-supply wire a small manual switch is included, and a meter is included in the supply wire.



1,138,283.

If the meter shows a leak, the switches are momentarily opened in turn until that switch is found which changes the deflection of the meter, thereby identifying the faulty line or circuit.

1,138,688. Self-Restoring Drop. Issued to A. C. Reid, assignor to Cracraft, Leich Electric Company, Genoa, Ill. The restoring of the shutter is effected by a smaller magnet located beneath the drop magnet.

1,138,698. Combined Transmitter and Receiver. Issued to E. S. Stewart and C. D. Stewart, Ottawa, Ill. A case of watch receiver type is air-tight; it is used as a receiver in the normal manner and then as a transmitter by speaking against the receiver diaphragm, the confined air transmitting the movement of the diaphragm to a carbon button located at the back of the case of the combined instrument.

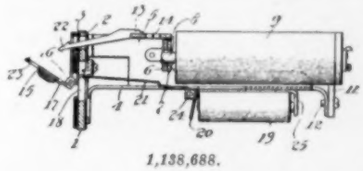
1,138,879. Release System. Issued to F. R. McBerty, assignor to Western Electric Company, New York, N. Y. (Application filed September 8, 1909.) The drawings show a semi-automatic system, the call being answered by the insertion of a manual switch plug, and then completed over automatic selecting switches. By the hanging up of the called telephone a signal lamp is operated at the manual switchboard, and by the withdrawal of the switch plug the automatic connection is released.

1,139,413. Transmitting System. Issued to Walton Harrison, New York, N. Y. (Application filed March 11, 1902.) The combination of a signaling circuit including a gap across which electricity flows for the purpose of controlling the strength of the signals, and means for exposing the gap to the action of varying quantities of sound-controlled untra-violet light.

1,139,722. Selector Switch. Issued to J. N. Reynolds, assignor to Western Electric Company, New York, N. Y. Groups of switch springs are fixed in position and movable plungers are made to operate them, first by selecting a group of plungers and then by selecting a plunger of the group.

1,139,589. Simple Fire Alarm System. Issued to Felix Gottschalk, Stirling, N. J. The receiver is removed from the hook and the hook is held down by a weight (which may be the receiver itself) suspended by a fusible wire. Should the wire melt by heat of a conflagration, the weight is released and a "permanent" signal is received at the telephone switchboard.

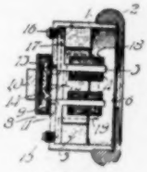
1,139,906. Alarm System for Automatic Exchange. Issued



1,138,688.

to Lipa Polinkowski, Assignor to Western Electric Company, New York, N. Y. Where line-finder switches are used to answer calls, it sometimes happens that there are not enough such switches to answer all of the calls; at such a time, this patent provides an alarm, the alarm being operated when the reserve switches are reduced to a certain minimum number.

1,139,956. Electromagnetic Key. Issued to E. B. Craft, assignor to Western Electric Company, New York, N. Y. When the key is manually operated an electromagnet holds it in that

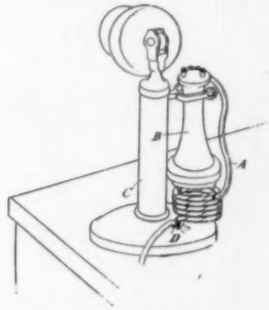


1,138,698.

position, subject to release of the first magnet by a second magnet. In addition, the contact springs are operated in part subsequently to the latching or locking of the switch parts.

1,140,136. Low-Expansion Wire. Issued to Byron E. Eldred, assignor to the Commercial Research Company, New York, N. Y. A composite low-expansion wire comprising a core of nickel steel and an external copper sheath welded thereto, the wire as a whole having a smaller expansion than platinum.

1,140,329. Back-Release Signal. Issued to E. A. Mellinger,



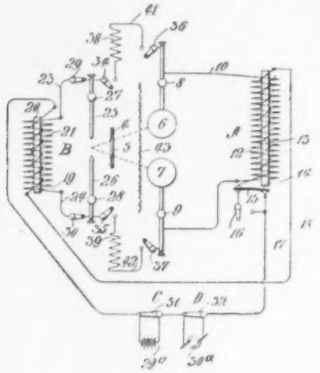
1,140,980.

Chicago, Ill. An alarm signal is arranged to be operated when the calling telephone has not been hung up after the called telephone has been hung up, in an automatic telephone exchange, and further means is provided for preventing the operating of the signal before the called telephone has answered. The alarm device is slow in operation, to avoid an alarm for very small differences in the hanging up of the two telephones.

1,140,366. Telephonic Apparatus. Issued to H. C. Egerton, assignor to Western Electric Company, New York, N. Y.

Two telephone receivers with diaphragms independently operable, have a common magnetic circuit.

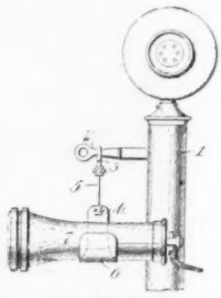
1,140,658. Selective Calling System. Issued to P. G. Bernholz, Schenectady, N. Y. Each telephone of a party line has a spring motor which propels a notched wheel, the notches of the stations being variantly located; the control office operator first sends an impulse to start the motors and then sends an im-



1,139,413.

pulse after the proper lapse of time, when the notch of the selected station will permit the operation of a relay which in turn will permit the ringing of the signal bell of that station.

1,140,946. Compensating Telephone Circuit. Issued to Sidney George Brown, London, England. In a telephone set, the receiver has an auxiliary circuit, or compensating circuit, from its own transmitter, so that the side tone of the transmitter is



1,139,859.

killed. The feature of novelty is the provision of adjustable resistances and capacity so that the compensation may be adjusted for the circuit of the line external to the transmitting station.

1,140,980. Receiver Cord. Issued to L. E. Haynes, Salt Lake City, Utah. In the receiver cord a spiral spring wire is included in such manner that the cord constantly tends to assume the form of a spiral of comparatively large diameter; whenever the cord is slacked it curls itself up neatly, and never, never tangles.

Using the Telephone in England

In this country, says an American who while in England recently had to do a lot of telephoning, if you wish to get a party on the telephone, whether he is in the same apartment block with you, a mile away or a thousand miles away, you tell the operator and wait anywhere from 10 seconds to a minute. If you have to wait three minutes you are highly indignant. Generally you have just about time enough between asking for the party and getting him, to lay down your cigar so the smoke won't bother you while talking, but in England you:

1. Call the operator.
2. Call the operator again.
3. Call the operator a third time.
4. Wait.
5. Wait some more.
6. Call the operator again.
7. Operator says "The service is engaged."
8. Wait some more.
9. Call operator.
10. Operator says, "Are you there?" and she says it with the funniest accent imaginable.
11. You become peeved and attempt to become facetious by saying, "No, I'm not 'there,' I'm 'here.'"
12. "How strange," comments the operator.
13. "I wish to talk with three ought nine six, Hyde Park," you say.
14. "Are you there?" asks the operator.
15. If you are unused to English telephone you lose your billie or nanny, as may be, and reply: "No, indeed, I am in Patagonia."
16. "Patagonia has no telephone," says the operator, highly indignant at wasting her time on such an ignorant person.
17. "Operator," you shout, "I want to get three ought nine six, Hyde Park."
18. "I beg pardon," says the operator.
19. "I want to get three ought nine six, Hyde Park," you say, distinctly. But you would strike a babe in arms at this stage.
20. "Are you there?" asks the operator.
21. Again you bite your lips, take a deep breath, clench your fist and then ask for the number.
22. "Kindly wait," says the operator.
23. "I'm the finest little waiter in three hemispheres," you shout, "but I should have walked, it would have been quicker"—
24. "Were you speaking?" asks operator.
25. "Have you got my party?" you ask.
26. "This is not a party—it's a telephone bureau," explains operator.
27. "I don't care whether it's a bureau or a highboy or a chiffonier or a davenport or just a plain hassock, I want Hyde Park three ought nine six, and I want"—
28. "Just a minute," says operator, "until I consult our rate book."
29. You wait.
30. You wait some more.
31. You wait ten minutes.
32. A friend, seeing you having convulsions at the telephone, looks at his watch and informs you that it is "half after noon and the telephone bureau is closed a half hour for lunch, you know, old chap." (And it is true, they all knock off work for lunch.)
33. Half an hour later—"Is this Central?"
34. "No, sir, if you please, this is the telephone bureau."
35. "I want Hyde Park three ought nine six," you say, this time beseechingly, plaintively, imploringly.
36. "The service is engaged, sir, if you please," the operator says.
37. "I know a dashed sight better," you shout, "it was engaged so long ago it is either married or deceased by this time"—
38. "Really, sir, this is no instrument for spoofing," the operator says, indignantly.
39. You repeat your request for three ought nine six, Hyde Park. There is a long wait.
40. "Hello, Hello, Hello!" you yell, putting the accent more and more on the syllable before the "o."
41. The operator replies, "Are you there?"

You are not there. You have sent a messenger to your friend in Hyde Park upon the advice of an English acquaintance, who found you, an hour after this still babbling incoherently.—*St. Louis Post-Dispatch Magazine.*

Of Interest to the Trade

What the Telephone and Accessory Manufacturers Are Doing to Advance the Art

Stromberg-Carlson Intercommunicating Feature

Intercommunicating systems almost universally employ as a signal the vibrating bell or buzzer operated by direct current. This ringer or buzzer is usually mounted within the case of a wall instrument, or the keybox associated with the desk telephone. But when the keybox is displaced by a simple push button block, as upon less expensive systems with one common talking pair and selective ringing only, a location for the signal becomes a problem. The problem has usually been passed on to, the installer and the buzzer screwed to the desk or a nearby wall. Such a disposition of the signal has several disadvantages which the Stromberg-Carlson Company claims to have successfully obviated by mounting the buzzer in the base of the desk stand.

Stromberg Intercommunicating Set.

Besides simplifying the work of installation, this method of mounting saves many a screw hole and drilling in the desk, as well as unsightly wiring. Both the buzzer and its circuit are better protected from accidental injury, and the buzzer is placed in such a position that its signal will attract immediate attention to the telephone. The circuit of the desk telephone is not complicated, only three conductors being required in the desk stand cord.

The accompanying illustration shows the type of desk telephone used, which is supplied with a standard common battery transmitter and receiver. A push button block is also shown with buttons for ringing ten other stations, and with designations opposite each button. Instruments of this type are furnished for any number of stations, and wall or combination telephones are also supplied for operation upon the same circuits. The Stromberg-Carlson Telephone Manufacturing Company, of Rochester, N. Y., will be pleased to furnish information to persons interested in intercommunicating apparatus regarding this feature or similar apparatus.

Chinese Commissioners Talk Across Continent

One of the incidents that will probably stand out prominently in the memories of the honorary commercial commissioners of China, who are in the United States for an extended tour of inspection of the commercial activities of this country, is the visit they paid to the Western Electric Company in New York City on June 5. This visit, in a measure, supplemented that made to the company's Hawthorne works during their stay in Chicago. On that occasion they inspected the cable shops, power house, general merchandise buildings and telephone apparatus shops under the guidance of the chief works officials. In the party at Hawthorne were fifteen Chinese, ten members of the Chicago Chamber of Commerce and representatives of the Chicago Telephone Company.

Guided by S. M. Spiller, who for the past three years has represented the Western Electric Company in China, the commissioners, Yingming Chang, son of Cheng Hsun Chang, chairman; S. C. Thomas Sze, coal merchant; Assistant General Manager Kailan, mining administration, Tientsin; Chaichang Woo, senior secretary, Ministry of Agriculture and Commerce, Peking; Mingtuan Siao, personal secretary to members of commission, and E. T. Williams, Chief of Bureau of Far Eastern Affairs, State Department, Washington, D. C., were escorted to the company's New York building where they were met by the company officials. They were then shown through the physical and circuit laboratories and finally taken to the exhibition room where various Western Electric products were demonstrated to them. One of the commissioners was so impressed with a portable vacuum cleaner that he immediately left directions to have one forwarded to his home in China. The commissioners were then shown a graphophone horn which hung suspended in the center of the room, and from which musical selections issued. The commissioners' eyes showed their amazement as they incredulously fingered the two thin wires which alone led to the horn in which, as was explained to them, there was concealed one of the new loud speaking receivers.

The distinguished visitors were then treated to an electrically cooked luncheon, after which they were taken to the Dey street building of the American Telephone and Telegraph Company where Chief Engineer J. J. Carty established a connection between his telephone and one at the company's exhibit at the Panama-Pacific International Exposition. Then Chi Chen Nieh, vice-chairman of the commission, David Z. T. Yui, secretary, who had by this time joined the party, and the other Chinese members of the commission were introduced over the telephone in turn to Shu Zen Chin, Chinese consul general at San Francisco, Ching Chi, Chinese commissioner general at San Francisco and W. S. Berry, representing the Western Electric Company.

The incident of the Chinese Commercial Commission talking in their own language from the Atlantic to the Pacific coast was one of the most romantic and interesting incidents of their trip. It served further to demonstrate the remarkable progress made in the telephone art when it is remembered that ten years ago on the occasion of the Commission's visit to this country, conversations were held between Chicago and Washington, at that time the greatest distance the human voice could be carried. This transcontinental telephone conversation cannot help but serve as a wonderful inspiration for these Chinese gentlemen to take back to their native land.

Stromberg Installaton at Ottawa, Kansas

The Stromberg-Carlson Telephone Manufacturing Company of Rochester, New York, recently closed an order with the Kansas Telephone Company for a complete central office equipment to be installed at Ottawa, Kansas. The system will be the Stromberg Company's standard common battery cut-off relay bridging three wire multiple type. The following apparatus is covered by the contract:

Nine sections of unit type single position switchboard sections, equipped for the immediate operation of 40 toll lines, 100 farmer lines and 1,000 lamp signal local lines.

Three of the positions will be equipped as toll positions; five as regular central energy operators' positions, and one as an annex position. The farmer line eqiupments are multipled throughout the switchboard along with the local lines. The cord equipment for the regular positions is of the four relay universal type, thus permitting connections to be made by an operator between the local subscribers' and farmer lines. The operator's equipment in each position consists of standard breast plate type transmitters and line and supervisory pilot equipments.

The board will be equipped with 3,600 multiple jacks distributed before the nine operators' positions in a six panel multiple. These jacks are their standard six panel type furnished in strips of twenty adn in banks of one hundred. The switchboard section will be of the unit type, having removable end panels, skeleton wooden frame, continuous face (that is, there will be no woodwork in the face equipment between the positions) swinging relay gates and lift-out doors. The plugboard and pilot-rail will be covered with formica.

The terminal equipment covered by the Ottawa contract will consist of nine verticals of m. d. f. ironwork, having an ultimate capacity to accommodate 1,800 lines and being equipped at present with the protectors and cable terminals necessary for the present requirements.

There will also be required for the terminal room an i. d. f. similar in construction to the m. d. f. relays. The battery equipment will consist of one set of 24-volt chloride accumulators, and associated with the battery will be furnished the necessary accessories, such as terminal lugs, sand trays, etc. The battery will be supported upon a wooden rack.

For charging the batteries there will be furnished a General Electric Company's mercury arc rectifier, capable of delivering 2 amperes. This rectifier will be furnished complete with insulating transformer, series reactance and extra tube. The ringing current will be furnished by a harmonic converter, dosigned to deliver 16, 33, 50 and 66 cycle current for ringing the subscribers' lines. A slate power board equipped with switches, measuring instruments and control devices will be furnished for handling the machine and battery equipment. Adjacent to this power board will be furnished a fuse panel for fusing the battery and ringing leads at the switchboard and other exchange equipment.

A wire chief's desk and a chief operator's desk will be furnished; each of these will be of the single position cordless type.

The good will, patents, contracts, formulae and part of the machinery of the Walpole Tire & Rubber Company of Walpole, Mass., have been sold to the Revere Rubber Company, which is now operating the property.

Kellogg Bulletin on Repeating Coils

A most instructive pamphlet is that recently published by the Kellogg Switchboard and Supply Company. It is on the subject of repeating coils and phantom circuits and is known as Bulletin No. 81.

Telephone men desirous of learning more about efficient transmission should have this new bulletin, which includes matters relating to phantom circuits, obtaining phantom circuits, line conditions, transpositions, etc. The subject-matter was written by a well-known Kellogg engineer, whose knowledge of this important branch of exchange management is wide and based on many years of practical experience in exchange operation. The circuits accompanying the text are instructive and readily understood. In addition to these are half-tone illustrations of the latest type of Kellogg coils for this class of work.

Any telephone man may obtain this bulletin by writing to the Kellogg Switchboard & Supply Company at Chicago.

Electric Power Club Meeting

The Electric Power Club, which is engaged in the commercial standardization of electrical machinery and which embraces in its membership all of the leading manufacturers of electrical machinery, met at Saegertown, Pa., on May 13, 14 and 15, for its annual convention. About forty-five representatives were in attendance.

The principal subject discussed at the meeting related to commercial temperature rise limits for all classes of electrical machinery. It was recognized that the standardization rules adopted by the American Institute of Electrical Engineers last year represented maximum permissible temperature rise limits and that it was properly the function of the Electric Power Club to determine what temperature standards falling within these limits best meet the actual conditions of commercial practice.

On impregnated fibrous insultation the maximum permissible temperature rise limit of the rules of the American Institute of Electrical Engineers is 50 degrees C. On small fractional horsepower motors, due to the conditions under which most of these motors are operated, and on single phase motors and direct current engine type generators, the members of the Electric Power Club were in favor of maintaining the present commercial standard of 40 degrees C. They were also in favor of deferring until July 1, 1916, any change in the basis of rating standard electric motors sold for general purposes, as it was felt that those were sold under unknown and indefinite conditions of service in most cases and that the users of such motors generally expected a greater leeway in capacity than would exist under the 50 degree C., continuous rating method. The present commercial standard for open type general purpose motors is 40 degrees C. It was also felt that on fully enclosed type motors, the present commercial standard of 50 degrees C. should be maintained, although this is 50 degrees higher than the maximum permissible limit under the rules of the American Institute of Electrical Engineers. On fully enclosed motors the temperature within the motor is more uniform, there is less danger of hot spots, and a lesser temperature gradient is permissible. An effort will be made to have this feature recognized in any future rules of the American Institute of Electrical Engineers.

The following ratings, speeds, and shaft diameters

were adopted as commercial standards for fractional horsepower motors:

H. P.	*Rated Speed*	*Diameter Shaft Extension*
1/8	1700/1750	1/2
1/6	1700/1750	1/2
1/4	1700/1750	5/8
1/3	1700/1750	5/8
1/2	1700/1750	3/4
3/4	1700/1750	3/4

Reports were made showing that considerable progress has been made during the past year in obtaining a working basis of co-operation with other associations, such as the American Institute of Electrical Engineers, the National Electric Light Association, and the new Associated Manufacturers of Electrical Supplies. E. H. Martindale of the Industrial Power Committee of the American Institute of Electrical Engineers presented to the Electrical Power Club at the meeting his views on the standardization of carbon brushes. This was referred to a committee to work out the standardization of carbon brushes along the lines suggested by Mr. Martindale, including a standardization of length, width, thickness and allowable limits.

A sincere vote of thanks was extended to the retiring president, Prof. Francis B. Crocker, for the very valuable work he had done during the past two years, in extending the scope and influence of the Electric Power Club along very broad lines of industrial standardization. At the close of the meeting the following officers were elected for the coming year: President, E. R. Harding of the Holtzer-Cabot Electric Company; vice-president, James Burke of the Burke Electric Company; secretary, C. H. Roth of Roth Bros. & Company.

Large Inter-Com-Phone System

J. J. Mack, manager and owner of the Telephone Sales and Equipment Company, who represents the Stromberg-Carlson Telephone Manufacturing Company in New York City, recently installed in the new offices of the Vacuum Oil Company of 61 Broadway, an Inter-Com-Phone system consisting of 72 stations.

The 72 stations comprises 6, 12, 22 and 32 station capacity instruments and most of these are of the combination telephone type. In the near future three more stations are to be installed, making a total of 75 stations.

When the Vacuum Oil Company contemplated installing a private telephone system, two members of the organization were appointed to investigate the various systems on the market and to decide which would best meet their particular requirements. The Stromberg-Carlson Inter-Com-Phone system was the one selected to be installed.

The wiring arrangement was worked out in a very feasible manner. Separate conduit was run under the floor from each telephone to the cable shaft in the center of the floor upon which the offices are located. At this point the various cables are fanned out and connected to Murdock double lock nut terminals and a cross connecting rack is installed to faciliate working out the desired combination of connections.

A small set of storage batteries supplies the energy for the talking, signaling, annunciator and bell circuits, which are charged from 110 volt direct current power mains through lamp resistance. These lamps are mounted on a small slate panel in connection with the charging and discharging switches. The batteries are charged regularly once a week and the entire system is maintained by Mr. Mack.

It is stated that the system is rendering excellent service.

"The Model T Ford Car" by Page

The large production and sale of Ford cars, totaling nearly 600,000, has warranted the publication of a special treatise on the repair and maintenance of the universal model, model T.

Victor W. Pagé is the author of such a treatise and his principal aim has been to present to the thousands of Ford users the first and fundamental principles, special photographs and drawings being used to make the subject-matter easy to comprehension.

"The Model T Ford Car," the title of this treatise is indeed splendid success and includes in its contents comprehensive discussion on the car, its parts and their functions; the engine and auxiliary groups; details of the chassis parts; driving and maintenance of Ford cars, and overhauling and repairing mechanism.

This valuable treatise is without a doubt the "best yet" on the Ford. With its low price of $1 per copy, it is expected that many users including telephone operating companies, will provide themselves with a copy in order to raise the efficiency of their plant departments by putting the instructions of the treatise into practical and efficient operation.

Stromberg-Carlson New Bulletin

"A Telephone on the Farm" is the title of a new bulletin recently issued by the Stromberg-Carlson Telephone Manufacturing Company, Rochester, New York. This bulletin has been prepared, the company states, to bring to the attention of those living on farms and in rural communities how a telephone may be obtained and to describe in a non-technical manner how a telephone system should be constructed and maintained.

A very interesting and convincing article on "The Value of the Telephone in Rural Communities" is contained in the bulletin, which sets forth the many advantages of the telephone to the farmer. A model constitution and by-laws are given and form for petitions to various authorities for securing rights of way are also presented.

Complete instructions are given for laying out a proposed telephone system, including specifications for poles, and the proper setting for poles of various lengths, guying and bracing brackets and cross arms, stringing and tying wires, methods of cutting in transportations, etc.

The installation of a magneto equipment is described in detail and a color code listed for a standard 50-pair cable. Some of the other points considered are the setting up of gravity batteries, the installation of telephones, lightning arresters, interior wiring, the various parts of a telephone, etc.

Any person who would like to obtain a copy of this bulletin should write to the advertising department for one at Rochester, New York.

Standard Ignition, Lighting and Starting Cables is the title and subject of a folder issued by the Standard Underground Cable Company for owners of motor cars, motor boats and motorcycles.

The Hercules Magnetizer

The Hercules Magnetizer is the name of an electromagnetic device being marketed by the Swedish-American Telephone Manufacturing Company, Chicago, a simple and low-priced apparatus, which would seem to be a necessity in the exchange for restoring weakened generator magnets. A folder describes the device.

Magnets should always be kept fully charged. All magnets lose their strength in time and this results in decreased efficiency of whatever device they are used on. This holds true of telephone apparatus, automobile, motorcycle and motor boat magnetos, charging and lighting generators, etc.

In telephone apparatus weak generator, receiver or ringer magnets will render satisfactory service impossible. In magnetos for gas or gasoline engines a fully charged magneto with "saturated" magnets gives a much fatter, hotter spark than one whose efficiency is lowered by weak magnets. Sending magnets to the manufacturer to be re-magnetized causes long delays and considerable expense, and they are often

Operating the Hercules Magnetizer.

demagnetized in transportation. These difficulties are eliminated by the Hercules Magnetizer, which is efficient, durable, compact, sturdy and easy to operate. It requires no experience to "charge" magnets—plain and simple instructions are furnished with each magnetizer. It will operate on five ordinary dry cells or a 6 volt storage battery or on 110 volt d. c. lighting circuit. It uses very little current—so little that its expense is practicably negligible. It is quickly adjustable to any size or shape of magnet, is equipped with a switch which automatically cuts off the current, and less than half a minute is required to fully energize or "re-magnetize" any magnet.

It is mounted on a heavy, insulating base—the whole device being neatly finished in nickel and black.

American's Construction Bulletin

"Construction of Country Telephone Lines" is the title of Bulletin No. 22 issued by the American Electric Company, Company, Chicago. To describe this booklet briefly, it contains all the information possibly needed by the small exchange and rural line telephone companies. It is a complete, practical guide for the installation and maintenance of this class of magneto plants. In conjunction with this information there is given interesting descriptions of some of the reliable telephone products of the American factory, the entire book of 60 pages being profusely illustrated.

This is the seventh edition of this work, and those who have former editions need not be told that the new and enlarged issue takes the place of several expensive text-books—and it is free to all telephone men who will take the trouble to ask for it.

"Central Energy Telephones" is the title of Bulletin No. 1010 just issued by the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. It is a 34-page booklet, which explains the operation and construction of central energy or common battery telephones in general and the Stromberg-Carlson instruments in particular. The booklet is interesting as well as informative, and at the price of a postal card should be in every telephone man's hands.

Awards to the Western

The International Jury of Award of the Panama-Pacific International Exposition has completed its work of judging exhibits in the Palace of Manufactures, and announces that it has awarded the following medals to the Western Electric Company:

The Grand Prix for the exhibit as a whole. This award signifies that the products exhibited are superior to all others of their kind in the world.

Gold medals, each as follows:

One for telephone switchboards and equipment, representing apparatus standard throughout the world;

Another for telephone train dispatching and control apparatus, representing a decided advance in the art, as evidenced by the adoption of this type of equipment by many of the leading railroads of the world;

A third, for insulated wires and cables, which represent a degree of perfection in the manufacture of telephone cable that contributes largely to the present day development of the telephone system.

Two bronze medals, awarded for the company's mine rescue equipment and mine telephones.

The following silver medals were awarded to manufacturers of electrical devices, with the distribution of whose products the Western Electric Company is closely identified. These companies had their products displayed in the Western Electric Company's exhibit:

To the American Electrical Heater Company for electric irons.

To the Gray Pay Station Company for telephone pay stations.

To Edwards and Company for annunciators.

To Conlon Washing Machine Company for Western Electric-Conlon washing machines.

These awards are in line with the large number of others made to the company wherever it has exhibited in previous years.

Oshkosh Catalog

The new catalog No. 45 of the Oshkosh Manufacturing Company, Oshkosh, Wisconsin, is being distributed to the trade. This is without a doubt one of the most complete manufacturers' catalogs of strictly outside construction tools and specialties ever issued, and every operating company is entitled to a copy. All standard heavy digging and pole raising tools are listed, as well as wire reels, tree trimmers, etc. Several new tools are listed as well as many new sizes of old ones.

Brevities of the Business

The Activities of the Whole Telephone Field Told in Short Paragraphs

PERSONAL NOTES.

Arthur Kneisel, who until recently was connected with the Chicago City Telephone Bureau of the Department of Public Service as assistant supervisor, has opened an office at Room 1056, 29 South La Salle street, Chicago, where he will engage in patent office practice, telephone engineering and public utility commission representation. Mr. Kneisel has had sixteen years of practical experience in every branch of the telephone field, his entire experience being a series of promotions from the lowest positions to the highest it could offer until he entered the patent department of the Telephone Improvement Company and studied patent law. While with this company he made studies of over 800 automatic, semi-automatic telephone and kindred patents and served as an expert in important interference and infringement suits. As assistant to the city telephone supervisor he conducted many of the special investigations which were made in connection with the count of automatic telephone subscribers in Chicago and compiled the reports of this important work. In the final report he suggested several plans whereby the automatic system might be saved to its patrons and be made more valuable to them as a "zone" system operated in connection with the Bell system. These plans also suggested that arrangements could be made to guarantee the bondholders the money invested by them and also pay liberal dividends on the investment required to build the interconnecting system.

B. G. Hubbell, president of the Federal Telephone and Telegraph Company at Buffalo, N. Y., a director of the Independent Telephone Association of America and known to all telephone men, had the grievous misfortune to lose his wife June 15. Mrs. Hubbell died while her husband was confined to a hospital with a serious illness and he was unable to attend her funeral. Mr. Hubbell is now on the road to regained health, but his terrible loss has retarded his recovery and delayed his business plans. All the telephone field grieves in sympathy with him.

Walter J. Uhl, president and general manager of the Logansport (Ind.) Home Telephone Company and a director of the Independent Association of America, lost by death a few days ago his only son, Dennis, who had been a sufferer for a long time. Mr. Uhl has been indefatigable in his search for help for the boy and his devotion has made his loss all the more keen. The hand of sympathy is extended to him by all the telephone field.

David S. Hulfish, chief engineer of the Canadian Machine Telephone Company and TELEPHONE ENGINEER'S patent expert, has again sailed for England to complete the cut-over of the automatic installation at Hereford, one of the British postoffice's trial exchanges. Before sailing Mr. Hulfish carefully made his will and put his house in order, but it is hoped he will not encounter any German submarines on the way over and that peace will have been declared before he returns, six months hence.

M. P. McMillan was recently promoted to manager of the Nevada district of the Pacific States Telephone & Telegraph Company, which includes the entire state of Nevada.

H. C. Kunkel has been appointed plant superintendent for the Harrisburg division of the Bell Telephone Company, of which Allentown, Bethlehem and Easton is a part. Mr. Kunkel's headquarters will be at Harrisburg.

Horace B. Weed, manager of the Mansfield-Ava Telephone Company at Mansfield, Mo., died at his residence in Mansfield on June 1.

F. B. Potter was recently appointed local manager of the Home Telephone Company at Hattiesburg, Miss., succeeding J. S. Clark.

Acting Manager C. P. White of the New York Telephone Company has been appointed local manager of the Lockport exchange, to succeed Charles F. Rees.

H. C. Porter, plant superintendent of the Harrisburg division of the Bell Telephone Company at Harrisburg, Pa., has been promoted to engineer of the outside plant at Philadelphia.

A. B. Wilson, local commercial manager of the New York Telephone Company, was one of the honored graduates at the eighty-third annual commencement exercises of the New York University, upon whom was conferred the degree of mechanical engineer. Mr. Wilson has been in charge of the New York Telephone Company's business at Plainfield, N. J., since 1913.

L. E. Schmidt has been appointed local manager and wire chief of the Clarinda, Iowa, office of the Iowa Telephone Company, suceeding P. L. Bowles.

Miss Alletha Shinn, for several months cashier of the Pioneer Telephone Company at Nowata, Kan., has been promoted to the position of manager of that exchange.

F. L. Woodruff, for the past two years general manager of the Cumberland Telephone & Telegraph Company at Louisville, Ky., has been transferred to Atlanta, Ga., to become general manager of the Southern Bell Telephone Company.

George F. Turnbull has been assigned the position of manager of the Cumberland Telephone & Telegraph Company at Louisville, Ky., succeeding F. L. Woodruff.

John P. Garner, formerly manager of the Chicago Telephone Company, has been appointed public service commissioner of Chicago under the Thompson administration, succeeding Montague Ferry.

NEWS FROM THE FIELD.

ALABAMA.

The question of granting the Southern Bell Telephone Company a franchise in New Decatur was discussed recently at a meeting of the executive session of the New Decatur city council.

ARKANSAS.

Fifty-five employes of the Southwestern Telephone & Telegraph Company in Little Rock were presented with medals for their length of service with the company on May 24.

On May 26 the Cypress Junction Telephone Company was organized at Cypress Junction. The officers of the company are: J. D. Arnold, president; L. M. Thomas, secretary, and F. Cumnock, treasurer.

Many improvements are being made by the Home Telephone Company in their telephone system at Ozark. The company has purchased 22,000 feet of cable wire, to be installed on lines north of the city, and when this work is completed the entire city will be cabled.

ARIZONA.

The corporation commission has granted the application of William B. Woods et al. for permission to transfer the Navajo-Apache telephone lines to the Arizona Electric Telephone Company. The new company was also granted permission to issue 24,985 shares of stock at $1 per share. It will continue to operate the Nelson lines in Apache and Navajo counties.

INDIANA.

Roachdale Telephone Company, Roachdale, $10,000; to operate telephone lines; J. W. Miller, James R. Britton, F. A. Britton.

A deal was completed recently whereby the physical property of the Delaware-Madison Telephone Company in Anderson and vicinity becomes the property of the Central Union Telephone Company, $100,000 being paid. The Delaware-Madison Company goes out of existence as an operating company, as

the Anderson property was the last to be taken over by the Central Union Company.

The annual meeting of the stockholders of the Lynn Local Telephone Company was held at Lynn recently. All of last year's directors were re-elected. Officers elected were: President, S. C. Bowen; vice-president, W. S. Halliday; treasurer, Daniel Hecker; secretary, Carl C. Bowen. Clarence Clark will continue to act as manager. The company declared its regular semi-annual dividend of 3 per cent.

ILLINOIS.

Montgomery County Telephone & Telegraph Company, Hillsboro; capital, $1,000; incorporators, C. W. Bliss, A. M. Howell, J. J. Frey.

Fire destroyed the switchboard of the Kinloch Telephone Company at Collinsville on May 28.

Intertownship Telephone Company, Shabbona; capital stock increased from $20,000 to $30,000.

A force of men began work a short time ago on the rebuilding of the Bushnell telephone exchange.

Articles of incorporation were filed recently by the Farmers Bluffs Telephone Company at Quincy. The company is capitalized at $4,000.

IOWA.

The local telephone company at Greene is placing all its wires underground, thus doing away with the many wires and poles which have been in use for so long.

The Northern Telephone Company have plans well under way for the erection of a new building at Sioux City, cost about $20,000.

Improvements amounting to $12,000 are being made by the Iowa Telephone Company at Audubon. Many of the wires will be placed underground.

Preparations are being made by the Appanoose County Telephone Company for the erection of a new telephone building at Centerville. The new building will be 25x90 feet in dimension, two stories and basement and will be absolutely fireproof.

The Northern Telephone Company is planning the erection of $12,000 fireproof building at Storm Lake this summer.

KANSAS.

Union Telephone Company, Galva; no capital stock.

It is rumored that the Arkansas Valley Telephone Company that has a toll line in all the towns down the Arkansas valley connecting at Great Bent, with the Bell line east, has the material ordered to complete their line from Dodge City to Hugoton. Their line now extends from Dodge City to Sublette, in Haskell county, and with the building of this line into Hugoton will give Elkhart a line into Dodge City and from there to eastern portions of Kansas or west into Colorado points or south into Oklahoma.

J. E. Marshall has nearly finished razing the old telephone office at Jefferson and will commence work on the construction of a new building within a short time.

Permission to the Galatia, Olmitz & Hoisington Telephone Company to purchase the property of the Mutual Telephone Company was granted rcently by the Kansas public utilities commission. The new company also will be allowed to issue $3,000 worth of common stock, according to the order issued by the commission.

The Southwestern Long Distance Telephone Company has purchased the telephone exchange at Minneola. Local officials say the exchange will be rebuilt and made up to date. An exchange building will likely be erected.

Plans are under way by the United Telephone Company for the construction of a telephone exchange at Concordia.

KENTUCKY.

Index & Hazel Green Telephone Company, Grassy Creek; capital $450. Incorporators: E. W. Day, J. L. Stamper, G. L. Rose, etc.

E. W. How recently sold an independent telephone line extending from Wickliffe to Blandville to the Home Telephone Company at Paducah.

MASSACHUSETTS.

New England Telephone & Telegraph Company declared the regular quarterly dividend of 1¾ per cent, payable June 30 to stock record of June 16.

MICHIGAN.

The Michigan State Telephone Company has appropriated $500,000 for improvements in Detroit service.

The annual meeting of the directors of the Michigan State Telephone Company was held in Detroit on June 11 and officers were elected as follows: President, B. E. Sunny, Chicago; vice-presidents, Dudley E. Waters, Grand Rapids; A. Burt, Chicago; H. F. Hill, Detroit; secretary, W. I. Mizner, Detroit; general manager, A. Von Schlegell, Detroit. The directors are U. N. Bethel, New York; F. W. Blair, Detroit; Dudley E. Waters and William Judson, Grand Rapids; A. Burt, Chicago; D. M. Cummings, Chicago; N. C. Kingsbury, New York; Henry Russell, Detroit; B. E. Sunny, Chicago, and T. N. Vail, New York.

MINNESOTA.

Plans are under way for the construction of a brick and concrete telephone central building at Fairmont.

A permit has been granted to the Tri-State Telephone Company at St. Paul for the construction of an addition to its exchange building on Hague avenue, between Dale and St. Albans streets. The addition will cost $6,300.

The Nicollet County Telephone Company held its annual meeting at St. Peter on June 9 and elected the following officers for the coming year: M. B. Johnson, president; C. C. Nelson, vice-president; C. W. Carpenter, manager; H. J. Essler, acting secretary; and Charles A. Benson, treasurer.

The semi-annual meeting of the Southern Minnesota Independent Telephone Association was held at the Alinrich Hotel, Mankato, on June 14 and 15. The meeting was very largely attended by representatives in the southern part of the state and a number of interesting addresses were made.

MISSOURI.

At a meeting of the directors of the Farmers Mutual Telephone Company, held at Oregon June 5, the following officers were elected for the coming year: President, John Lacey; vice-president, W. J. Mahon; secretary, H. E. Milne; treasurer, George Stephenson.

MONTANA.

Delpine Telephone Company of Delpine, Meagher county. Incorporators: Edward G. Holliday, Charles H. Southworth and William Frisbie. To build between Martinsdale and White Sulphur Springs. Capital, $3,000; $600 subscribed.

The Farmers Mutual Telephone Company has been incorporated by J. A. Beck, M. H. Mammen, C. H. Frey, of Broadview, which is principal place of business; $15,000 capital stock. Lines are to be extended through Yellowstone, Stillwater and Musselshell counties.

The annual meeting of the Pioneer Telephone Company was held June 4 and officers for the ensuing year were elected as follows: George McCone, president; Andrew Larson, vice-president, and C. A. Rasmussen, secretary-treasurer and general manager. The company is now building a line into the new town of Brockway, sixty miles northwest of Glendive, and expects to have it in operation within the next few weeks.

The Rocky Mountain Telephone Company has purchased rights of way in the Shields River valley from a number of ranchers residing near Clyde Park. Among those selling the rights were A. T. Wright, H. S. Amos, Frank Blair, C. F. Boyd and Dr. S. E. Leard.

Plans are under way for the installation of a new telephone system at Denton.

NEBRASKA.

The Chadron Telephone Company recently added one more exchange to its list. A deal was made recently whereby this company became owner of the Valentine exchange. John E. Wilson will be manager of the exchange.

The Lincoln Telephone & Telegraph Company has appealed from a decision of the state railway commission, which recently granted permission to the Peoples Telephone Company of Sterling to issue $21,500 in stock for the establishment of a competing exchange at Sterling.

At a meeting held recently by the board of directors of the Linwood Telephone Company the following directors were elected for the coming year: Thomas Duda, J. B. Tichacek, Frank Faytinger, W. F. Dawson and F. F. Mundil. An 8 per cent dividend was declared.

Work was commenced recently which will result in Clay Center having a complete new telephone system of the very latest and best kind.

NEW JERSEY.

The largest switchboard of its kind in the world has been placed into service in the local home of the Delaware & Atlantic Telegraph & Telephone Company at Trenton. The switchboard has been installed in the new headquarters of the local branch, the handsome new structure on East State street.

Vice-Chancellor Backes recently granted an order permitting James Kerney of Trenton, receiver, to sell all the property and the assets of the Inter-State Telephone Company valued at several millions of dollars. The sale will include the telephone plants in Trenton, Elizabeth, Atlantic City, Millville, Bridgeton and other towns.